SUBTASK 1.15 – PASSIVE DIFFUSION SAMPLE BAGS MADE FROM EXPANDED POLYTETRAFLUOROETHYLENE (ePTFE) TO MEASURE VOC CONCENTRATIONS IN GROUNDWATER

Final Report

For the Period April 1, 2003, through June 30, 2006

Prepared for:

AAD Document Control
U.S. Department of Energy
National Energy Technology Laboratory
PO Box 10940, MS921-107
Pittsburgh, PA 15236-0940

DOE Contract No. DE-FC26-98FT40320
Performance Monitor: Andrew O'Palko

Prepared by:

Barry W. Botnen

Energy & Environmental Research Center
University of North Dakota
15 North 23rd Street, Stop 9018
Grand Forks, ND, 58202-9018

2006-EERC-09-01 September 2006

DOE DISCLAIMER

ACKNOWLEDGMENT

This report was prepared with the support of the U.S. Department of Energy (DOE) National Energy Technology Laboratory Cooperative Agreement No. DE-FC26-98FT40320. However, any opinions, findings, conclusions, or recommendations expressed herein are those of the authors(s) and do not necessarily reflect the views of DOE.

EERC DISCLAIMER

SUBTASK 1.15 – PASSIVE DIFFUSION SAMPLE BAGS MADE FROM EXPANDED POLYTETRAFLUOROETHYLENE (ePTFE) TO MEASURE VOC CONCENTRATIONS IN GROUNDWATER

ABSTRACT

With laboratory testing of expanded polytetrafluoroethylene (ePTFE) membranes complete, collected data support that volatile organic compound (VOC) molecules will readily diffuse across ePTFE membranes. Membrane samples, supplied by BHA Technologies (GE Osmonics), were tested to determine diffusion rates for VOCs in groundwater. Tests were conducted using membranes with two different pore sizes, with and without thermally laminated spunbond backing, and multiple concentrations of contaminated groundwater. Results suggest that typical residence times associated with traditional samplers constructed of polyethylene (2 weeks) can be reduced by 1 week using ePTFE membranes (reducing project costs) and that VOCs will diffuse more readily at lower temperatures (2.2°–3.3°C) across ePTFE materials.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

SUBTASK 1.15 – PASSIVE DIFFUSION SAMPLE BAGS MADE FROM EXPANDED POLYTETRAFLUOROETHYLENE (ePTFE) TO MEASURE VOC CONCENTRATIONS IN GROUNDWATER

EXECUTIVE SUMMARY

Passive diffusion bag (PDB) samplers are used to measure concentrations of a variety of volatile organic compounds (VOCs) in groundwater at monitoring wells (1). This technology has gained significant acceptance by regulatory agencies and the environmental industry. PDB samplers provide an advantage over traditional methods for obtaining samples. Conventional bailer and/or pump-sampling techniques increase turbidity, create investigation-derived wastes in the form of purge water, and may not provide representative samples due to constituent volatilization. Typical PDB samplers (sleeves) are constructed of low-density polyethylene that are filled with distilled, deionized water and heat-sealed at both ends. The sleeves are placed into monitoring wells and are allowed to equilibrate with the surrounding water. After the specified residence time (typically 2 weeks), the samplers are retrieved from the well, and the enclosed water is immediately transferred to laboratory-approved sample containers for analysis. Field tests show good correlation between samples obtained with PDB samplers and samples obtained using traditional purge and sample methods, at significant cost savings (approximately one-fourth the cost of traditional low-flow purge methods) (1).

The purpose of this project was to determine whether a more efficient PDB sampler could be constructed. A PDB sampler, constructed of polytetrafluoroethylene (ePTFE) material, will reduce the time that a sampler needs to remain in a monitoring well for equilibration and also increase the range of constituents that can effectively move across the membrane at lower temperatures. This reduction in residence time would allow field personnel to place and collect samplers in one sampling event, rather than making subsequent trips to collect samples.

With laboratory testing of expanded ePTFE membranes complete, collected data support that VOC molecules will readily diffuse across ePTFE membranes. Membrane samples, supplied by BHA Technologies (GE Osmonics), were tested to determine diffusion rates for VOCs in groundwater. Tests were conducted using membranes with two different pore sizes, with and without thermally laminated spunbond backing, and multiple concentrations of contaminated ground water. Results suggest that typical residence times associated with traditional samplers constructed of polyethylene (2-weeks) can be reduced by 1 week using ePTFE membranes (reducing project costs), and that VOCs will diffuse more readily at lower temperatures (2.2°–3.3°C) across ePTFE materials.

SUBTASK 1.15 – PASSIVE DIFFUSION SAMPLE BAGS MADE FROM EXPANDED POLYTETRAFLUOROETHYLENE (ePTFE) TO MEASURE VOC CONCENTRATIONS IN GROUNDWATER

INTRODUCTION

Passive diffusion bag (PDB) samplers are used to measure concentrations of a variety of volatile organic compounds (VOCs) in groundwater at monitoring wells (1). This technology provides an advantage over traditional methods for obtaining samples. Conventional bailer and/or pump-sampling techniques increase turbidity, create investigation-derived wastes in the form of purge water, and may not provide representative samples because of constituent volatilization. Typical PDB samplers (sleeves) are constructed of low-density polyethylene that are filled with distilled, deionized water and heat-sealed at both ends (Figure 1). The sleeves are lowered into a monitoring well and allowed to equilibrate with the surrounding water. After the specified residence time (typically 2 weeks), the samplers are retrieved from the well, and the enclosed water is immediately transferred to laboratory-approved sample containers for analysis. Field tests show good correlation between samples obtained with PDB samplers and samples obtained using traditional purge and sample methods, at significant cost savings (approximately one-fourth the cost of traditional low-flow purge methods)(2).

The rate at which the water within the PDB sampler equilibrates with ambient water depends on multiple factors, including the type of compound being sampled and the water temperature(2). With polyethylene sleeves, 2 weeks is standard (at 21°C) for benzene, toluene, ethylbenzene, and xylenes (BTEX constituents)(2).

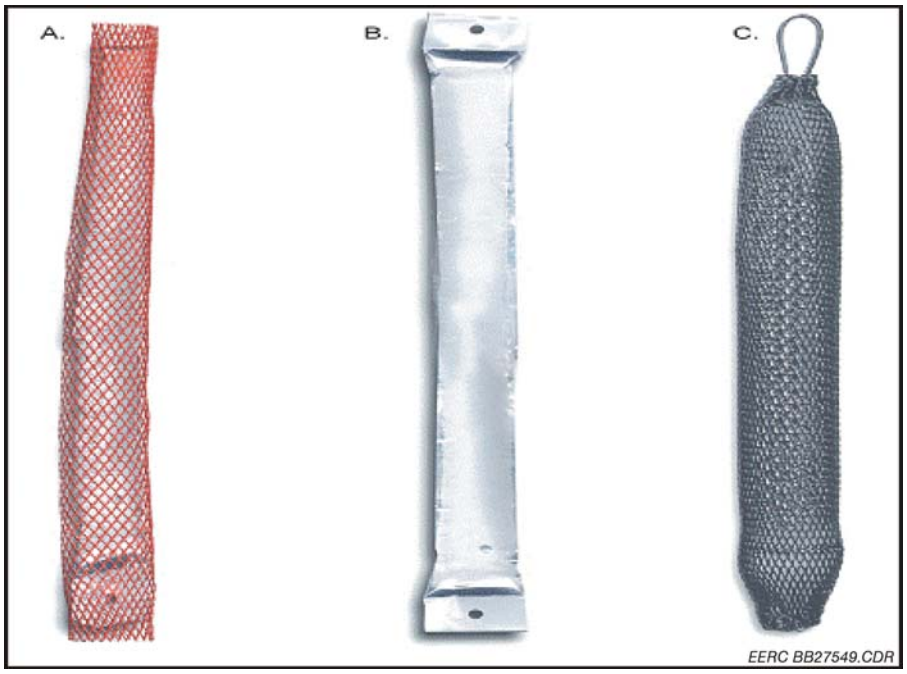


Figure 1. Typical passive diffusion bag (2).

Many factors influence the ability of compounds to diffuse across a traditional polyethylene membrane. Rates of diffusion depend on the molecular size and shape of the compound. Pore sizes in polyethylene do not exceed 10 Å in diameter, while pore spaces in ePTFE (0.1 µm) are 1000 Å in diameter. A typical benzene molecule is about 6.5 Å in diameter.

The purpose of this project was to determine whether a more efficient PDB sampler could be constructed. A PDB sampler, constructed of ePTFE material, will reduce the time that a sampler needs to remain in a monitoring well for equilibration and also increase the range of constituents that could effectively move across the membrane at lower temperatures. This reduction in residence time would allow field personnel to place and collect samplers in one sampling event, rather than making subsequent trips to collect samples, thereby reducing overall project costs.

The ePTFE membrane is constructed of Teflon, stretched at a high temperature to form a porous, air-permeable material. Teflon is nonpolar and chemically inert, with no known solvating agent. Typical uses for ePTFE membranes are for industrial, consumer, and healthcare applications. ePTFE membranes are regarded as the most durable, breathable fabrics on the market today. With a 0.1- µm pore space, these membranes contain nine billion randomly spaced microscopic pores per square inch. Each pore is ~20,000 times smaller than a water droplet, but 700 times larger than a water vapor molecule. Because of the small pore size, water and many organic solvents penetrate the membrane as a vapor but not as a liquid (3).

EXPERIMENTAL

Sample ePTFE membranes were obtained from GE Osmonics (formerly BHA Technologies). The initial membranes that were received, with pore sizes of 0.1 and 1.0-µm, were thermally laminated to a polypropylene spunbond backing. The membranes were in 22 × 28-cm sheet form. During the first two trial runs, a significant amount of air entered the sampler along channels created by the spunbond backing, creating volatilization of contaminants. Membranes without backing were used for all subsequent trial runs, and the volatilization issues were resolved.

Specifically for this project, a sample vessel was designed by the EERC and constructed by At-Mar Glass Inc. The vessel consists of two 2-liter chambers that are connected and clamped in the middle (Figure 2). The membrane to be tested divides the two chambers. One chamber is filled with laboratory-tested deionized (DI) water and the other with contaminated groundwater taken from groundwater monitoring wells located in Bismarck, North Dakota. The chambers are filled completely then sealed, with little or no headspace, to minimize volatilization. Initial project and duplicate samples were collected from both chambers as they were filled. After a predetermined amount of time had passed, samples were again collected from each chamber, stored at 4°C, and shipped to Minnesota Valley Testing Laboratories (MVTL) in New Ulm, Minnesota, for analysis. Prior to each time trial, the sampler was decontaminated using Alconox with a deionized water rinse, then heated to 296°C to remove all residual contamination.

Figure 2. Sample vessel.

The sample matrix for this project consists of eight sample runs, representing five time trials (Table 1). At each time interval, one set of (two) samples were collected and analyzed for methyl *tert*-butyl ether (MTBE), BTEX constituents, and gasoline range organics (GRO). All samples were duplicated.

Table 1. Sample Matrix

Sample Run	24 hour	48 hour	96 hour	7 day	13 day	DI Water Samples	Duplicate Samples
Run 1			X			X	X
Run 2	X					X	X
Run 3					X	X	X
Run 4				X		X	X
Run 5		X				X	X
Run 6				X		X	X
Run 7			X			X	X
Run 8		X				X	X

RESULTS AND DISCUSSION

Run One

The first trial run consisted of membrane QY111, a 0.1-µm ePTFE membrane thermally laminated to a polypropylene spunbond substrate. The chamber was filled and allowed to equilibrate for 96 hours before samples were collected and sent for analysis. It was determined that this sample set was compromised by volatilization within the sampler. Air was entering the sampler along the spunbond backer portion of the membrane. This was addressed by requesting membranes without the backer attached. Because of production problems at the GE plant facility, significant delays in sampling were experienced.

Run Two

During the production delay, a second test was conducted using the same membrane as the first trial, utilizing a different clamping method in an effort to eliminate volatilization. Again, a significant amount of air entered the sampler, eliminating the opportunity to acquire a representative sample.

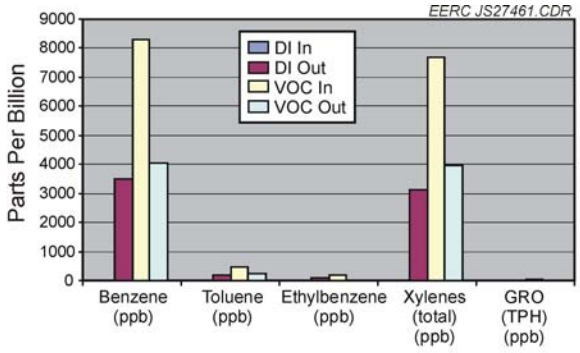
Run Three

Trial Three tested membrane QM011 (QY111 without backing), a 0.1- µm ePTFE membrane. The chamber was filled, covered, and placed in a temperature-controlled environment at 3.3°C and allowed to equilibrate for 13 days. Results indicate that all of the BTEX constituents diffused across the membrane within the time frame allotted (Table 2). VOC-in results (yellow column) display the contaminated groundwater placed into the sampler initially, while the DI-out and VOC-out columns (red and blue columns, respectively) indicate equilibration results at the end of the time trial. DI-in results were nondetects and, therefore, are not represented by a column. Mass balance estimates indicate that little volatilization occurred during the sampling period, which can be easily visualized by stacking the red and blue columns and comparing to the height of the yellow (VOC-in) column.

Table 2. Run Three Results

	DI In	VOC In	DI Out	VOC Out
MTBE	<1	<100 #	<100 #	<100 #
Benzene (ppb)	<1	8304	3502	4050
Toluene (ppb)	<1	466.4	199.9	239.5
Ethylbenzene (ppb)	<1	200.2	88.2	<100 #
Xylenes (total) (ppb)	<3	7674	3128	3951
GRO (TPH) (mg/L)	<0.2	48.75	14.8	22.9

Due to sample concentration
Note: 13-day sample time, covered and placed in controlled 3.3°C environment.



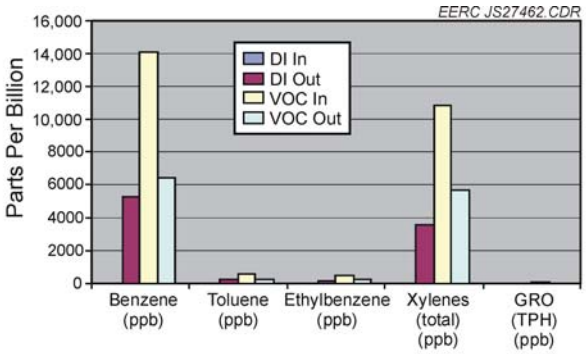
Run Four

Trial Four tested membrane QM011 (QY111 without backing), with a 7-day residence time at 2.2°C. Results indicate that all BTEX constituents again passed through the membrane and showed a near equal equilibration, even though the residence time was cut in half from Run Three (Table 3). This reduction in residence time realized the goal of the project.

Table 3. Run Four Results

	DI In	VOC In	DI Out	VOC Out
MTBE	<1	<10 #	<10 #	<10 #
Benzene (ppb)	<1	14,090	5290	6405
Toluene (ppb)	<1	549.3	217	274.7
Ethylbenzene (ppb)	<1	489.4	164	235.2
Xylenes (total) (ppb)	<3	10,860	3616	5667
GRO (TPH) (mg/L)	<0.2	57.04	17.94	26.68

Due to sample concentration
Note: 7-day sample time, covered and placed in controlled 2.2°C environment.



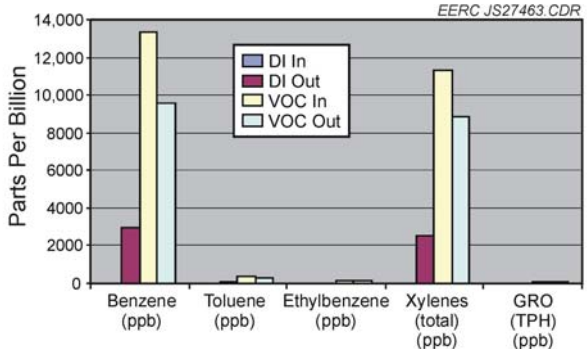
Run Five

Trial Five tested membrane QM011 (QY111 without backing), with a 2-day residence time at 3.3°C. Results showed that VOC concentrations had not equilibrated within the sampler (Table 4). This suggests that a 2-day residence time, at low temperatures (below 4°C), is not sufficient for equilibration.

Table 4. Run Five Results

	DI In	VOC In	DI Out	VOC Out
MTBE	<1	<10	<10	<10
Benzene (ppb)	<1	13,330	3005	9548
Toluene (ppb)	<1	391.1	82.1	283.7
Ethylbenzene (ppb)	<1	154.7	35.4	109.6
Xylenes (total) (ppb)	<3	11,350	2546	8814
GRO (TPH) (mg/L)	<0.2	54.26	10.12	41.5

Note: 2-day sample time, covered and placed in controlled 3.3°C environment.



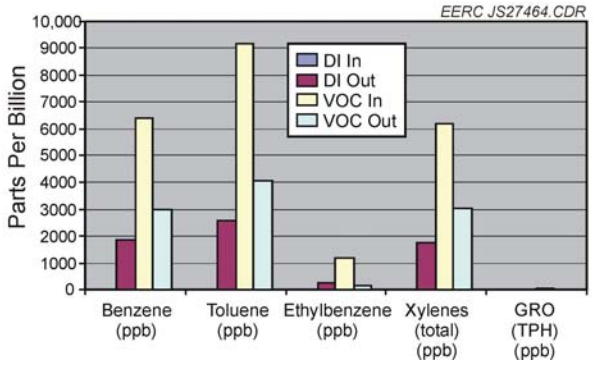
Run Six

Trial Six tested membrane QM007 (without backing), with a 7-day residence time (Table 5) at 2.2°C. The QM007 membrane has a pore space size of 1.0 micron. Results indicated that utilizing a membrane with a larger pore size (0.1 to 1.0 micron) does not necessarily decrease equilibration time (during this sample run). This information could be useful when sampling in highly turbid waters, where fine sediments could enter the sampler. BTEX constituents did not totally equilibrated within the sampler during this time trial. However, it is anticipated that by using a sampler in sleeve form (as opposed to a flat membrane), the results would be more favorable.

Table 5. Run Six Results

	DI In	VOC In	DI Out	VOC Out
MTBE	<1	<200	<20	<100
Benzene (ppb)	<1	6385	1868	2966
Toluene (ppb)	<1	9151	2559	4062
Ethylbenzene (ppb)	<1	1166	237	180
Xylenes (total) (ppb)	<3	6165	1727	3058
GRO (TPH) (mg/L)	<0.2	55.22	13.65	25.39

Note: 7-day sample time, covered and placed in controlled 2.2°C environment.



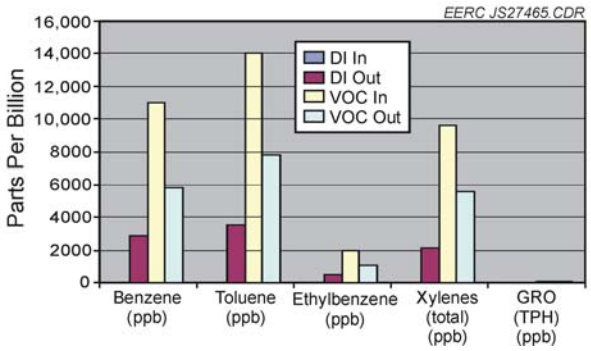
Run Seven

Trial Seven tested membrane QM007 (without backing), with a 4-day residence time at 3.3°C. The constituents did not fully equilibrate within 4 days. However, small air bubbles were present in the sample chamber (on the DI side). This could account for decreased levels of contaminant in the DI-out sample (Table 6).

Table 6. Run Seven Results

	DI In	VOC In	DI Out	VOC Out
MTBE	<1	<200	<200	<200
Benzene (ppb)	<1	11,010	2831	5863
Toluene (ppb)	<1	14,060	3508	7809
Ethylbenzene (ppb)	<1	1967	456.9	1046
Xylenes (total) (ppb)	<3	9577	2157	5551
GRO (TPH) (mg/L)	<0.2	79.27	21.23	45.74

Note: 4-day sample time, covered and placed in controlled 3.3°C environment.



Run Eight

Trial Eight tested membrane QM007 (without backing), with a 2-day residence time at 2.2°C. Groundwater with significantly lower contaminant concentrations was used for this time trial. The results from the 2-day run show good correlation between samples collected from each side of the chamber, indicating rapid BTEX constituent diffusion (Table 7). A complete summary of all sample results is provided in Table 8, with details and lab reports provided in Appendix A.

Table 7. Run Eight Results

	DI In	VOC In	DI Out	VOC Out
MTBE	<1	<100	<10	<10
Benzene (ppb)	<1	233.6	62.2	102.4
Toluene (ppb)	<1	517	139	207.1
Ethylbenzene (ppb)	<1	1295	369.4	556.6
Xylenes (total) (ppb)	<3	8740	2694	4079
GRO (TPH) (mg/L)	<0.2	39.91	11.32	20.98

Note: 2-day sample time, covered and placed in controlled 2.2°C environment.

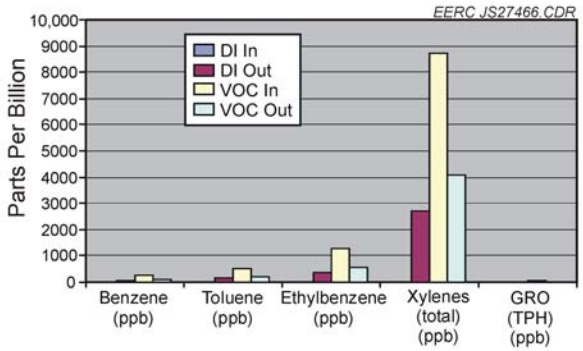


Table 8. Complete Summary of All Sample Results

	Run 3				Run 4				Run 5			
	DI In	VOC In	DI Out	VOC Out	DI In	VOC In	DI Out	VOC Out	DI In	VOC In	DI Out	VOC Out
MTBE	<1	<100 #	<100 #	<100 #	<1	<10 #	<10 #	<10 #	<1	<10	<10	<10
Benzene (ppb)	<1	8304	3502	4050	<1	14090	5290	6405	<1	13330	3005	9548
Toluene (ppb)	<1	466.4	199.9	239.5	<1	549.3	217	274.7	<1	391.1	82.1	283.7
Ethylbenzene (ppb)	<1	200.2	88.2	<100 #	<1	489.4	164	235.2	<1	154.7	35.4	109.6
Xylenes (total) (ppb)	<3	7674	3128	3951	<3	10860	3616	5667	<3	11350	2546	8814
GRO (TPH) (mg/L)	<0.2	48.75	14.8	22.9	<0.2	57.04	17.94	26.68	<0.2	54.26	10.12	41.5

	Run 6				Run 7				Run 8			
	DI In	VOC In	DI Out	VOC Out	DI In	VOC In	DI Out	VOC Out	DI In	VOC In	DI Out	VOC Out
MTBE	<1	<200	<20	<100	<1	<200	<200	<200	<1	<100	<10	<10
Benzene (ppb)	<1	6385	1868	2966	<1	11010	2831	5863	<1	233.6	62.2	102.4
Toluene (ppb)	<1	9151	2559	4062	<1	14060	3508	7809	<1	517	139	207.1
Ethylbenzene (ppb)	<1	1166	237	180	<1	1967	456.9	1046	<1	1295	369.4	556.6
Xylenes (total) (ppb)	<3	6165	1727	3058	<3	9577	2157	5551	<3	8740	2694	4079
GRO (TPH) (mg/L)	<0.2	55.22	13.65	25.39	<0.2	79.27	21.23	45.74	<0.2	39.91	11.32	20.98

CONCLUSIONS

The results from the experiment confirm that BTEX constituents will readily diffuse across an ePTFE membrane. It is evident that a decrease in residence time can be achieved by using the ePTFE membrane, as opposed to traditional PDB materials.

All VOC-contaminated water utilized for this series of experiments was obtained from groundwater monitoring wells located in Bismarck, North Dakota. It would be very difficult, if

not impossible, to duplicate parameters found in a natural system by spiking laboratory-grade water. It would be more representative to test actual sleeves constructed of ePTFE materials rather than the sheet form membranes. It is anticipated that the DI water inside a sleeve would equilibrate much more efficiently if it were completely surrounded by a contaminated water bath.

Our limited experiments indicate that further refinement of sample sleeves, control parameters, and sampling chamber is necessary, as well as a greatly increased sample matrix, to fully understand the diffusion rates of all groundwater contaminants across ePTFE membranes.

REFERENCES

1. Vroblesky, D.A., *User's Guide for Polyethylene-Based Passive Diffusion Bag Samplers to Obtain Volatile Organic Compound Concentrations in Wells: Part 1. Deployment Recovery, Data Interpretation, and Quality Control and Assurance*: U.S. Geological Survey Water Resources Investigations Report 01-4060 and 01-4061; 2001 (a & b).

2. ITRC. www.itrcweb.org (June 2006).

3. W.L. Gore & Associates. www.gore.com (2002).

APPENDIX A

DETAILS AND LAB REPORTS

MINNESOTA VALLEY TESTING LABORATORIES, INC.
1126 N. Front St. ~ New Ulm, MN 56073 ~ 800-782-3557 ~ Fax 507-359-2890
1411 S. 12th St. ~ Bismarck, ND 58502 ~ 800-279-6885 ~ Fax 701-258-9724
35 W. Lincoln Way ~ Nevada, IA 50201 ~ 800-362-0855 ~ Fax 515-382-3885
www.mvtl.com

BARRY BOTTEN
ENERGY & ENVIRONMENTAL RESEARCH CTR
UNIVERSITY OF NORTH DAKOTA
GRAND FORKS ND 58203

Project Name: MEMBRANE

Sample Description: DI-IN

Report Date: 7 Sep 05
Lab Number: 05-A30607
Work Order #:82-1792
Account #: 007033
Sample Matrix: GROUNDWATER
Date Sampled: 17 Aug 05 9:50
Date Received: 31 Aug 05
PO #: 3927
Chain of Custody Number: 2835
Temp at Receipt: 4.0 C

	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
Methyl Tert-Butyl Ether	< 1	ppb	1	8021/5030	31 Aug 05	ACH
Benzene	< 1	ppb	1	8021/5030	31 Aug 05	ACH
Toluene	< 1	ppb	1	8021/5030	31 Aug 05	ACH
Ethyl Benzene	< 1	ppb	1	8021/5030	31 Aug 05	ACH
Xylenes (Total)	< 3	ppb	3	8021/5030	31 Aug 05	ACH
GRO (TPH)	< 0.2	mg/L	0.2	8015B/OA1	31 Aug 05	ACH

BTEX/GRO Sample pH < 2

BTEX/GRO SURROGATE RECOVERY: 89 %

BTEX/GRO SURROGATE2 RECOVERY: 92 %

RL = Reporting Limit

Elevated "Less Than Result" (<): @ = Due to sample matrix # = Due to sample concentration
! = Due to sample quantity + = Due to extract volume

CERTIFICATION: MN LAB # 027-015-125 WI LAB # 999447680 ND MICRO # 1013-M ND WW/DW # R-040 IA LAB #: 132

MINNESOTA VALLEY TESTING LABORATORIES, INC.
1126 N. Front St. ~ New Ulm, MN 56073 ~ 800-782-3557 ~ Fax 507-359-2890
1411 S. 12th St. ~ Bismarck, ND 58502 ~ 800-279-6885 ~ Fax 701-258-9724
35 W. Lincoln Way ~ Nevada, IA 50201 ~ 800-362-0855 ~ Fax 515-382-3885
www.mvtl.com

BARRY BOTTEN
ENERGY & ENVIRONMENTAL RESEARCH CTR
UNIVERSITY OF NORTH DAKOTA
GRAND FORKS ND 58203

Project Name: MEMBRANE

Sample Description: DI-IN D

Report Date: 7 Sep 05
Lab Number: 05-A30608
Work Order #:82-1792
Account #: 007033
Sample Matrix: GROUNDWATER
Date Sampled: 17 Aug 05 10:17
Date Received: 31 Aug 05
PO #: 3927
Chain of Custody Number: 2835
Temp at Receipt: 4.0 C

	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
Methyl Tert-Butyl Ether	< 1	ppb	1	8021/5030	31 Aug 05	ACH
Benzene	< 1	ppb	1	8021/5030	31 Aug 05	ACH
Toluene	< 1	ppb	1	8021/5030	31 Aug 05	ACH
Ethyl Benzene	< 1	ppb	1	8021/5030	31 Aug 05	ACH
Xylenes (Total)	< 3	ppb	3	8021/5030	31 Aug 05	ACH
GRO (TPH)	< 0.2	mg/L	0.2	8015B/OA1	31 Aug 05	ACH

BTEX/GRO Sample pH < 2

BTEX/GRO SURROGATE RECOVERY: 91 %

BTEX/GRO SURROGATE2 RECOVERY: 92 %

RL = Reporting Limit

Elevated "Less Than Result" (<): @ = Due to sample matrix # = Due to sample concentration
! = Due to sample quantity + = Due to extract volume

CERTIFICATION: MN LAB # 027-015-125 WI LAB # 999447680 ND MICRO # 1013-M ND WW/DW # R-040 IA LAB #: 132

MINNESOTA VALLEY TESTING LABORATORIES, INC.

1126 N. Front St. ~ New Ulm, MN 56073 ~ 800-782-3557 ~ Fax 507-359-2890
1411 S. 12th St. ~ Bismarck, ND 58502 ~ 800-279-6885 ~ Fax 701-258-9724
35 W. Lincoln Way ~ Nevada, IA 50201 ~ 800-362-0855 ~ Fax 515-382-3885
www.mvtl.com

MEMBER ACIL

BARRY BOTTEN
ENERGY & ENVIRONMENTAL RESEARCH CTR
UNIVERSITY OF NORTH DAKOTA
GRAND FORKS ND 58203

Project Name: MEMBRANE

Sample Description: VOC-IN

Report Date: 7 Sep 05
Lab Number: 05-A30609
Work Order #:82-1792
Account #: 007033
Sample Matrix: GROUNDWATER
Date Sampled: 17 Aug 05 10:20
Date Received: 31 Aug 05
PO #: 3927
Chain of Custody Number: 2835
Temp at Receipt: 4.0 C

	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
Methyl Tert-Butyl Ether	< 100 #	ppb	1	8021/5030	1 Sep 05	ACH
Benzene	8304	ppb	1.0	8021/5030	1 Sep 05	ACH
Toluene	466.4	ppb	1.0	8021/5030	1 Sep 05	ACH
Ethyl Benzene	200.2	ppb	1.0	8021/5030	1 Sep 05	ACH
Xylenes (Total)	7674	ppb	3.0	8021/5030	1 Sep 05	ACH
GRO (TPH)	48.75	mg/L	0.200	8015B/OA1	1 Sep 05	ACH

BTEX/GRO Sample pH < 2

BTEX/GRO SURROGATE RECOVERY: 102 %

BTEX/GRO SURROGATE2 RECOVERY: 90 %

GRO(TPH) pattern is characteristic of gasoline.

RL = Reporting Limit

Elevated "Less Than Result" (<): @ = Due to sample matrix
! = Due to sample quantity
= Due to sample concentration
+ = Due to extract volume

CERTIFICATION: MN LAB # 027-015-125 WI LAB # 999447680 ND MICRO # 1013-M ND WW/DW # R-040 IA LAB #: 132

MINNESOTA VALLEY TESTING LABORATORIES, INC.
1126 N. Front St. ~ New Ulm, MN 56073 ~ 800-782-3557 ~ Fax 507-359-2890
1411 S. 12th St. ~ Bismarck, ND 58502 ~ 800-279-6885 ~ Fax 701-258-9724
35 W. Lincoln Way ~ Nevada, IA 50201 ~ 800-362-0855 ~ Fax 515-382-3885
www.mvtl.com

BARRY BOTTEN
ENERGY & ENVIRONMENTAL RESEARCH CTR
UNIVERSITY OF NORTH DAKOTA
GRAND FORKS ND 58203

Project Name: MEMBRANE

Sample Description: VOC-IN D

Report Date: 7 Sep 05
Lab Number: 05-A30610
Work Order #:82-1792
Account #: 007033
Sample Matrix: GROUNDWATER
Date Sampled: 17 Aug 05 10:22
Date Received: 31 Aug 05
PO #: 3927
Chain of Custody Number: 2835
Temp at Receipt: 4.0 C

	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
Methyl Tert-Butyl Ether	< 100 #	ppb	1	8021/5030	1 Sep 05	ACH
Benzene	8614	ppb	1.0	8021/5030	1 Sep 05	ACH
Toluene	475.1	ppb	1.0	8021/5030	1 Sep 05	ACH
Ethyl Benzene	200.3	ppb	1.0	8021/5030	1 Sep 05	ACH
Xylenes (Total)	7852	ppb	3.0	8021/5030	1 Sep 05	ACH
GRO (TPH)	50.00	mg/L	0.200	8015B/OA1	1 Sep 05	ACH

BTEX/GRO Sample pH < 2

BTEX/GRO SURROGATE RECOVERY: 103 %

BTEX/GRO SURROGATE2 RECOVERY: 90 %

GRO(TPH) pattern is characteristic of gasoline.

RL = Reporting Limit

Elevated "Less Than Result" (<): @ = Due to sample matrix # = Due to sample concentration
! = Due to sample quantity + = Due to extract volume

CERTIFICATION: MN LAB # 027-015-125 WI LAB # 999447680 ND MICRO # 1013-M ND WW/DW # R-040 IA LAB #: 132

MINNESOTA VALLEY TESTING LABORATORIES, INC.

1126 N. Front St. ~ New Ulm, MN 56073 ~ 800-782-3557 ~ Fax 507-359-2890
1411 S. 12th St. ~ Bismarck, ND 58502 ~ 800-279-6885 ~ Fax 701-258-9724
35 W. Lincoln Way ~ Nevada, IA 50201 ~ 800-362-0855 ~ Fax 515-382-3885
www.mvtl.com

BARRY BOTTEN
ENERGY & ENVIRONMENTAL RESEARCH CTR
UNIVERSITY OF NORTH DAKOTA
GRAND FORKS ND 58203

Project Name: MEMBRANE

Sample Description: DI-OUT

Report Date: 7 Sep 05
Lab Number: 05-A30611
Work Order #:82-1792
Account #: 007033
Sample Matrix: GROUNDWATER
Date Sampled: 30 Aug 05 14:00
Date Received: 31 Aug 05
PO #: 3927
Chain of Custody Number: 2835
Temp at Receipt: 4.0 C

	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
Methyl Tert-Butyl Ether	< 100 #	ppb	1	8021/5030	2 Sep 05	ACH
Benzene	3502	ppb	1.0	8021/5030	2 Sep 05	ACH
Toluene	199.9	ppb	1.0	8021/5030	2 Sep 05	ACH
Ethyl Benzene	88.2	ppb	1.0	8021/5030	2 Sep 05	ACH
Xylenes (Total)	3128	ppb	3.0	8021/5030	2 Sep 05	ACH
GRO (TPH)	14.80	mg/L	0.200	8015B/OA1	2 Sep 05	ACH

BTEX/GRO Sample pH < 2

BTEX/GRO SURROGATE RECOVERY: 101 %

BTEX/GRO SURROGATE2 RECOVERY: 91 %

GRO(TPH) pattern is characteristic of gasoline.

RL = Reporting Limit

Elevated "Less Than Result" (<): @ = Due to sample matrix # = Due to sample concentration
! = Due to sample quantity + = Due to extract volume

CERTIFICATION: MN LAB # 027-015-125 WI LAB # 999447680 ND MICRO # 1013-M ND WW/DW # R-040 IA LAB #: 132

MINNESOTA VALLEY TESTING LABORATORIES, INC.

1126 N. Front St. ~ New Ulm, MN 56073 ~ 800-782-3557 ~ Fax 507-359-2890
1411 S. 12th St. ~ Bismarck, ND 58502 ~ 800-279-6885 ~ Fax 701-258-9724
35 W. Lincoln Way ~ Nevada, IA 50201 ~ 800-362-0855 ~ Fax 515-382-3885
www.mvtl.com

MEMBER ACIL

BARRY BOTTEN
ENERGY & ENVIRONMENTAL RESEARCH CTR
UNIVERSITY OF NORTH DAKOTA
GRAND FORKS ND 58203

Project Name: MEMBRANE

Sample Description: DI-OUT D

Report Date: 7 Sep 05
Lab Number: 05-A30612
Work Order #:82-1792
Account #: 007033
Sample Matrix: GROUNDWATER
Date Sampled: 30 Aug 05 14:05
Date Received: 31 Aug 05
PO #: 3927
Chain of Custody Number: 2835
Temp at Receipt: 4.0 C

	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
Methyl Tert-Butyl Ether	< 100 #	ppb	1	8021/5030	2 Sep 05	ACH
Benzene	3567	ppb	1.0	8021/5030	2 Sep 05	ACH
Toluene	210.5	ppb	1.0	8021/5030	2 Sep 05	ACH
Ethyl Benzene	85.7	ppb	1.0	8021/5030	2 Sep 05	ACH
Xylenes (Total)	3114	ppb	3.0	8021/5030	2 Sep 05	ACH
GRO (TPH)	14.77	mg/L	0.200	8015B/OA1	2 Sep 05	ACH

BTEX/GRO Sample pH < 2

BTEX/GRO SURROGATE RECOVERY: 104 %

BTEX/GRO SURROGATE2 RECOVERY: 89 %

GRO(TPH) pattern is characteristic of gasoline.

RL = Reporting Limit

Elevated "Less Than Result" (<): @ = Due to sample matrix
! = Due to sample quantity
= Due to sample concentration
+ = Due to extract volume

CERTIFICATION: MN LAB # 027-015-125 WI LAB # 999447680 ND MICRO # 1013-M ND WW/DW # R-040 IA LAB #: 132

MINNESOTA VALLEY TESTING LABORATORIES, INC.
1126 N. Front St. ~ New Ulm, MN 56073 ~ 800-782-3557 ~ Fax 507-359-2890
1411 S. 12th St. ~ Bismarck, ND 58502 ~ 800-279-6885 ~ Fax 701-258-9724
35 W. Lincoln Way ~ Nevada, IA 50201 ~ 800-362-0855 ~ Fax 515-382-3885
www.mvtl.com

Report Date: 7 Sep 05
Lab Number: 05-A30613
Work Order #:82-1792
Account #: 007033
Sample Matrix: GROUNDWATER
Date Sampled: 30 Aug 05 14:10
Date Received: 31 Aug 05
PO #: 3927
Chain of Custody Number: 2835
Temp at Receipt: 4.0 C

BARRY BOTTEN
ENERGY & ENVIRONMENTAL RESEARCH CTR
UNIVERSITY OF NORTH DAKOTA
GRAND FORKS ND 58203

Project Name: MEMBRANE

Sample Description: VOC-OUT

	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
Methyl Tert-Butyl Ether	< 100 #	ppb	1	8021/5030	1 Sep 05	ACH
Benzene	4050	ppb	1.0	8021/5030	1 Sep 05	ACH
Toluene	239.5	ppb	1.0	8021/5030	1 Sep 05	ACH
Ethyl Benzene	< 100 #	ppb	1	8021/5030	1 Sep 05	ACH
Xylenes (Total)	3951	ppb	3.0	8021/5030	1 Sep 05	ACH
GRO (TPH)	22.90	mg/L	0.200	8015B/OA1	1 Sep 05	ACH

BTEX/GRO Sample pH < 2

BTEX/GRO SURROGATE RECOVERY: 100 %

BTEX/GRO SURROGATE2 RECOVERY: 91 %

GRO(TPH) pattern is characteristic of gasoline.

RL = Reporting Limit

Elevated "Less Than Result" (<): @ = Due to sample matrix # = Due to sample concentration
! = Due to sample quantity + = Due to extract volume

CERTIFICATION: MN LAB # 027-015-125 WI LAB # 999447680 ND MICRO # 1013-M ND WW/DW # R-040 IA LAB #: 132

MINNESOTA VALLEY TESTING LABORATORIES, INC.
1126 N. Front St. ~ New Ulm, MN 56073 ~ 800-782-3557 ~ Fax 507-359-2890
1411 S. 12th St. ~ Bismarck, ND 58502 ~ 800-279-6885 ~ Fax 701-258-9724
35 W. Lincoln Way ~ Nevada, IA 50201 ~ 800-362-0855 ~ Fax 515-382-3885
www.mvtl.com

BARRY BOTTEN
ENERGY & ENVIRONMENTAL RESEARCH CTR
UNIVERSITY OF NORTH DAKOTA
GRAND FORKS ND 58203

Project Name: MEMBRANE

Sample Description: VOC-OUT D

Report Date: 7 Sep 05
Lab Number: 05-A30614
Work Order #:82-1792
Account #: 007033
Sample Matrix: GROUNDWATER
Date Sampled: 30 Aug 05 14:15
Date Received: 31 Aug 05
PO #: 3927
Chain of Custody Number: 2835
Temp at Receipt: 4.0 C

	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
Methyl Tert-Butyl Ether	< 100 #	ppb	1	8021/5030	1 Sep 05	ACH
Benzene	3895	ppb	1.0	8021/5030	1 Sep 05	ACH
Toluene	226.2	ppb	1.0	8021/5030	1 Sep 05	ACH
Ethyl Benzene	< 100 #	ppb	1	8021/5030	1 Sep 05	ACH
Xylenes (Total)	3753	ppb	3.0	8021/5030	1 Sep 05	ACH
GRO (TPH)	23.53	mg/L	0.200	8015B/OA1	1 Sep 05	ACH

BTEX/GRO Sample pH < 2

BTEX/GRO SURROGATE RECOVERY: 100 %

BTEX/GRO SURROGATE2 RECOVERY: 90 %

GRO(TPH) pattern is characteristic of gasoline.

RL = Reporting Limit

Elevated "Less Than Result" (<): @ = Due to sample matrix # = Due to sample concentration
! = Due to sample quantity + = Due to extract volume

CERTIFICATION: MN LAB # 027-015-125 WI LAB # 999447680 ND MICRO # 1013-M ND WW/DW # R-040 IA LAB #: 132

MINNESOTA VALLEY TESTING LABORATORIES, INC.

1126 N. Front St. ~ New Ulm, MN 56073 ~ 800-782-3557 ~ Fax 507-359-2890
1411 S. 12th St. ~ Bismarck, ND 58502 ~ 800-279-6885 ~ Fax 701-258-9724
35 W. Lincoln Way ~ Nevada, IA 50201 ~ 800-362-0855 ~ Fax 515-382-3885
www.mvtl.com

BARRY BOTTEN
ENERGY & ENVIRONMENTAL RESEARCH CTR
UNIVERSITY OF NORTH DAKOTA
GRAND FORKS ND 58203

Project Name: MEMBRANE

Sample Description: TRIP BLANK

Report Date: 7 Sep 05
Lab Number: 05-A30615
Work Order #:82-1792
Account #: 007033
Sample Matrix: GROUNDWATER
Date Sampled: 30 Aug 05
Date Received: 31 Aug 05
PO #: 3927
Chain of Custody Number: 2835
Temp at Receipt: 4.0 C

	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
Methyl Tert-Butyl Ether	< 1	ppb	1	8021/5030	1 Sep 05	ACH
Benzene	< 1	ppb	1	8021/5030	1 Sep 05	ACH
Toluene	< 1	ppb	1	8021/5030	1 Sep 05	ACH
Ethyl Benzene	< 1	ppb	1	8021/5030	1 Sep 05	ACH
Xylenes (Total)	< 3	ppb	3	8021/5030	1 Sep 05	ACH
GRO (TPH)	< 0.2	mg/L	0.2	8015B/OA1	1 Sep 05	ACH

** No collection time supplied by the client.

BTEX/GRO Sample pH < 2

BTEX/GRO SURROGATE RECOVERY: 97 %

BTEX/GRO SURROGATE2 RECOVERY: 87 %

RL = Reporting Limit

Elevated "Less Than Result" (<): @ = Due to sample matrix # = Due to sample concentration
! = Due to sample quantity + = Due to extract volume

CERTIFICATION: MN LAB # 027-015-125 WI LAB # 999447680 ND MICRO # 1013-M ND WW/DW # R-040 IA LAB #: 132

MVTL LABORATORIES, Inc.

CHAIN OF CUSTODY RECORD

Page 1 of 1

~~1411 South 12th Street~~ 1126 North Front St
~~Bismarck, ND 58504~~ New Ulm, MN 56073

PLEASE DO NOT WRITE IN THE SHADED AREAS

Nº 2835

Phone: (701) 258-9720
Toll Free: (800) 279-6885 Fax: (701) 258-9724

NO. 8012 P. 2

WORK ORDER #: 82-1792

Company Name and Address:	Account #:	Phone #:
EERC P.O. Box 9018 Grand Forks, ND 58202	007033	(701) 777-5073
	Contact: Barry Botnen	Fax #: (701) 777-5181
	Name of Sampler:	For faxed report check box ☑
Billing Address (indicate name and address if different from above):	Quote #:	Date Submitted: 8/30/05
	Project Name/Number: MEMBRANE	Purchase Order #:

Lab Use Only	Your Sample I.D. or Number	Sample Description	Date / Time	Type of Sample (Matrix or Substance): Soil	Water	Food	Other (Please Be Specific)	Analyze For: Vitamin A, TKN, Iron, Calcium, BOD, COD, Acetone, Shelf Life
	Example	Tank Bottom Tank #3	01/01/99 1145 a.m.			X	Sampled Liquid Layer Not Bottom sludge	
A30607	DI-IN		8-17-05 0950		✓			MBTEX + C-RO
01	DI-IN D		8-17-05 1017		✓			
09	VOC-IN		8-17-05 1020		✓			
10	VOC-IN D		8-17-05 1022		✓			
11	DI-OUT		8-30-05 1400		✓			
12	DI-OUT D		8-30-05 1405		✓			(LOW LEVELS)
13	VOC-OUT		8-30-05 1410		✓			
14	VOC-OUT D		8-30-05 1415		✓			
15	TRIP BLK		— —		✓			
					✓			

	Transferred by:	Comments: (Sample Condition)	Date / Time	Received by:	Comments: (Sample Condition)	Date / Time	°C
1			8/30/05 0900	Mary D. Fraase		30 Aug 05 11:25	4.0C
2							
3							

Disposed of By:

Disposal Comments: 4-Sample Post Holding Time
Diem
Barry Botn
MAD 8-31-05 11:5

K11475 (REVISED 10/03) MVTL-NEW ULM 507-359-2890 FAX 507-354-8517 WWW.MVTL.COM

Please submit the top two copies with your samples. We will return the completed original with your results.

MINNESOTA VALLEY TESTING LABORATORIES, INC.

1126 N. Front St. ~ New Ulm, MN 56073 ~ 800-782-3557 ~ Fax 507-359-2890
1411 S. 12th St. ~ Bismarck, ND 58502 ~ 800-279-6885 ~ Fax 701-258-9724
35 W. Lincoln Way ~ Nevada, IA 50201 ~ 800-362-0855 ~ Fax 515-382-3885
www.mvtl.com

MEMBER ACIL

BARRY
EERC-UND
15 N 23RD ST
GRAND FORKS ND 58203

Project Name: PDB
Sample Description: DI IN

Report Date: 31 Mar 05
Lab Number: 05-A6783
Work Order #:82-417
Account #: 007027
Sample Matrix: GROUNDWATER
Date Sampled: 17 Mar 05
Date Received: 22 Mar 05
Chain of Custody Number: 94481
Temp at Receipt: 3.0 C

	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
Benzene	< 1	ppb	1	8021/5030	28 Mar 05 11:00	TB
Toluene	< 1	ppb	1	8021/5030	28 Mar 05 11:00	TB
Ethyl Benzene	< 1	ppb	1	8021/5030	28 Mar 05 11:00	TB
Xylenes (Total)	< 3	ppb	3	8021/5030	28 Mar 05 11:00	TB
GRO (TPH)	< 0.2	mg/L	0.2	8015B/OA1	28 Mar 05 11:00	TB

BTEX/GRO Sample pH < 2

BTEX/GRO SURROGATE RECOVERY: 99 %

BTEX/GRO SURROGATE2 RECOVERY: 105 %

RL = Reporting Limit

Elevated "Less Than Result" (<): @ = Due to sample matrix
! = Due to sample quantity
= Due to sample concentration
+ = Due to extract volume

CERTIFICATION: MN LAB # 027-015-125 WI LAB # 999447680 ND MICRO # 1013-M ND WW/DW # R-040 IA LAB #: 132

MINNESOTA VALLEY TESTING LABORATORIES, INC.
1126 N. Front St. ~ New Ulm, MN 56073 ~ 800-782-3557 ~ Fax 507-359-2890
1411 S. 12th St. ~ Bismarck, ND 58502 ~ 800-279-6885 ~ Fax 701-258-9724
35 W. Lincoln Way ~ Nevada, IA 50201 ~ 800-362-0855 ~ Fax 515-382-3885
www.mvtl.com
MEMBER ACIL

BARRY
EERC-UND
15 N 23RD ST
GRAND FORKS ND 58203

Project Name: PDB
Sample Description: DI IN D

Report Date: 31 Mar 05
Lab Number: 05-A6784
Work Order #:82-417
Account #: 007027
Sample Matrix: GROUNDWATER
Date Sampled: 17 Mar 05
Date Received: 22 Mar 05
Chain of Custody Number: 94481
Temp at Receipt: 3.0 C

	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
Benzene	< 1	ppb	1	8021/5030	28 Mar 05 11:00	TB
Toluene	< 1	ppb	1	8021/5030	28 Mar 05 11:00	TB
Ethyl Benzene	< 1	ppb	1	8021/5030	28 Mar 05 11:00	TB
Xylenes (Total)	< 3	ppb	3	8021/5030	28 Mar 05 11:00	TB
GRO (TPH)	< 0.2	mg/L	0.2	8015B/OA1	28 Mar 05 11:00	TB

BTEX/GRO Sample pH < 2

BTEX/GRO SURROGATE RECOVERY: 107 %

BTEX/GRO SURROGATE2 RECOVERY: 102 %

RL = Reporting Limit

Elevated "Less Than Result" (<): @ = Due to sample matrix
! = Due to sample quantity
= Due to sample concentration
+ = Due to extract volume

CERTIFICATION: MN LAB # 027-015-125 WI LAB # 999447680 ND MICRO # 1013-M ND WW/DW # R-040 IA LAB #: 132

MINNESOTA VALLEY TESTING LABORATORIES, INC.

1126 N. Front St. ~ New Ulm, MN 56073 ~ 800-782-3557 ~ Fax 507-359-2890
1411 S. 12th St. ~ Bismarck, ND 58502 ~ 800-279-6885 ~ Fax 701-258-9724
35 W. Lincoln Way ~ Nevada, IA 50201 ~ 800-362-0855 ~ Fax 515-382-3885
www.mvtl.com

MEMBER ACIL

BARRY
EERC-UND
15 N 23RD ST
GRAND FORKS ND 58203

Project Name: PDB
Sample Description: VOC IN

Report Date: 31 Mar 05
Lab Number: 05-A6785
Work Order #:82-417
Account #: 007027
Sample Matrix: GROUNDWATER
Date Sampled: 17 Mar 05
Date Received: 22 Mar 05
Chain of Custody Number: 94481
Temp at Receipt: 3.0 C

	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
Benzene	143.0	ppb	1.0	8021/5030	28 Mar 05 11:00	TB
Toluene	< 5 #	ppb	1	8021/5030	28 Mar 05 11:00	TB
Ethyl Benzene	< 5 #	ppb	1	8021/5030	28 Mar 05 11:00	TB
Xylenes (Total)	24.6	ppb	3.0	8021/5030	28 Mar 05 11:00	TB
GRO (TPH)	< 1 #	mg/L	0.2	8015B/OA1	28 Mar 05 11:00	TB

BTEX/GRO Sample pH < 2

BTEX/GRO SURROGATE RECOVERY: 103 %

BTEX/GRO SURROGATE2 RECOVERY: 103 %

RL = Reporting Limit

Elevated "Less Than Result" (<): @ = Due to sample matrix
! = Due to sample quantity
= Due to sample concentration
+ = Due to extract volume

CERTIFICATION: MN LAB # 027-015-125 WI LAB # 999447680 ND MICRO # 1013-M ND WW/DW # R-040 IA LAB #: 132

MINNESOTA VALLEY TESTING LABORATORIES, INC.
1126 N. Front St. ~ New Ulm, MN 56073 ~ 800-782-3557 ~ Fax 507-359-2890
1411 S. 12th St. ~ Bismarck, ND 58502 ~ 800-279-6885 ~ Fax 701-258-9724
35 W. Lincoln Way ~ Nevada, IA 50201 ~ 800-362-0855 ~ Fax 515-382-3885
www.mvtl.com
MEMBER ACIL

BARRY
EERC-UND
15 N 23RD ST
GRAND FORKS ND 58203

Project Name: PDB
Sample Description: VOC IN D

Report Date: 31 Mar 05
Lab Number: 05-A6786
Work Order #:82-417
Account #: 007027
Sample Matrix: GROUNDWATER
Date Sampled: 17 Mar 05
Date Received: 22 Mar 05
Chain of Custody Number: 94481
Temp at Receipt: 3.0 C

	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
Benzene	143.5	ppb	1.0	8021/5030	28 Mar 05 11:00	TB
Toluene	< 5 #	ppb	1	8021/5030	28 Mar 05 11:00	TB
Ethyl Benzene	< 5 #	ppb	1	8021/5030	28 Mar 05 11:00	TB
Xylenes (Total)	26.2	ppb	3.0	8021/5030	28 Mar 05 11:00	TB
GRO (TPH)	< 1 #	mg/L	0.2	8015B/OA1	28 Mar 05 11:00	TB

BTEX/GRO Sample pH < 2

BTEX/GRO SURROGATE RECOVERY: 100 %

BTEX/GRO SURROGATE2 RECOVERY: 104 %

RL = Reporting Limit

Elevated "Less Than Result" (<): @ = Due to sample matrix # = Due to sample concentration
! = Due to sample quantity + = Due to extract volume

CERTIFICATION: MN LAB # 027-015-125 WI LAB # 999447680 ND MICRO # 1013-M ND WW/DW # R-040 IA LAB #: 132

MINNESOTA VALLEY TESTING LABORATORIES, INC.

1126 N. Front St. ~ New Ulm, MN 56073 ~ 800-782-3557 ~ Fax 507-359-2890
1411 S. 12th St. ~ Bismarck, ND 58502 ~ 800-279-6885 ~ Fax 701-258-9724
35 W. Lincoln Way ~ Nevada, IA 50201 ~ 800-362-0855 ~ Fax 515-382-3885
www.mvtl.com

MEMBER ACIL

BARRY
EERC-UND
15 N 23RD ST
GRAND FORKS ND 58203

Report Date: 31 Mar 05
Lab Number: 05-A6787
Work Order #:82-417
Account #: 007027
Sample Matrix: GROUNDWATER
Date Sampled: 21 Mar 05
Date Received: 22 Mar 05
Chain of Custody Number: 94481
Temp at Receipt: 3.0 C

Project Name: PDB
Sample Description: DI OUT

	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
Benzene	5.2	ppb	1.0	8021/5030	28 Mar 05 11:00	TB
Toluene	< 1	ppb	1	8021/5030	28 Mar 05 11:00	TB
Ethyl Benzene	< 1	ppb	1	8021/5030	28 Mar 05 11:00	TB
Xylenes (Total)	< 3	ppb	3	8021/5030	28 Mar 05 11:00	TB
GRO (TPH)	< 0.2	mg/L	0.2	8015B/OA1	28 Mar 05 11:00	TB

BTEX/GRO Sample pH < 2

BTEX/GRO SURROGATE RECOVERY: 103 %

BTEX/GRO SURROGATE2 RECOVERY: 101 %

RL = Reporting Limit

Elevated "Less Than Result" (<): @ = Due to sample matrix
! = Due to sample quantity
= Due to sample concentration
+ = Due to extract volume

CERTIFICATION: MN LAB # 027-015-125 WI LAB # 999447680 ND MICRO # 1013-M ND WW/DW # R-040 IA LAB #: 132

MINNESOTA VALLEY TESTING LABORATORIES, INC.

1126 N. Front St. ~ New Ulm, MN 56073 ~ 800-782-3557 ~ Fax 507-359-2890
1411 S. 12th St. ~ Bismarck, ND 58502 ~ 800-279-6885 ~ Fax 701-258-9724
35 W. Lincoln Way ~ Nevada, IA 50201 ~ 800-362-0855 ~ Fax 515-382-3885
www.mvtl.com

MEMBER ACIL

BARRY
EERC-UND
15 N 23RD ST
GRAND FORKS ND 58203

Project Name: PDB
Sample Description: DI OUT D

Report Date: 31 Mar 05
Lab Number: 05-A6788
Work Order #:82-417
Account #: 007027
Sample Matrix: GROUNDWATER
Date Sampled: 21 Mar 05
Date Received: 22 Mar 05
Chain of Custody Number: 94481
Temp at Receipt: 3.0 C

	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
Benzene	5.0	ppb	1.0	8021/5030	28 Mar 05 11:00	TB
Toluene	< 1	ppb	1	8021/5030	28 Mar 05 11:00	TB
Ethyl Benzene	< 1	ppb	1	8021/5030	28 Mar 05 11:00	TB
Xylenes (Total)	< 3	ppb	3	8021/5030	28 Mar 05 11:00	TB
GRO (TPH)	< 0.2	mg/L	0.2	8015B/OA1	28 Mar 05 11:00	TB

BTEX/GRO Sample pH < 2

BTEX/GRO SURROGATE RECOVERY: 99 %

BTEX/GRO SURROGATE2 RECOVERY: 101 %

RL = Reporting Limit

Elevated "Less Than Result" (<): @ = Due to sample matrix # = Due to sample concentration
! = Due to sample quantity + = Due to extract volume

CERTIFICATION: MN LAB # 027-015-125 WI LAB # 999447680 ND MICRO # 1013-M ND WW/DW # R-040 IA LAB #: 132

MINNESOTA VALLEY TESTING LABORATORIES, INC.

1126 N. Front St. ~ New Ulm, MN 56073 ~ 800-782-3557 ~ Fax 507-359-2890
1411 S. 12th St. ~ Bismarck, ND 58502 ~ 800-279-6885 ~ Fax 701-258-9724
35 W. Lincoln Way ~ Nevada, IA 50201 ~ 800-362-0855 ~ Fax 515-382-3885
www.mvtl.com

MEMBER ACIL

BARRY
EERC-UND
15 N 23RD ST
GRAND FORKS ND 58203

Project Name: PDB
Sample Description: VOC OUT

Report Date: 31 Mar 05
Lab Number: 05-A6789
Work Order #:82-417
Account #: 007027
Sample Matrix: GROUNDWATER
Date Sampled: 21 Mar 05
Date Received: 22 Mar 05
Chain of Custody Number: 94481
Temp at Receipt: 3.0 C

	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
Benzene	< 1	ppb	1	8021/5030	28 Mar 05 11:00	TB
Toluene	< 1	ppb	1	8021/5030	28 Mar 05 11:00	TB
Ethyl Benzene	< 1	ppb	1	8021/5030	28 Mar 05 11:00	TB
Xylenes (Total)	< 3	ppb	3	8021/5030	28 Mar 05 11:00	TB
GRO (TPH)	< 0.2	mg/L	0.2	8015B/OA1	28 Mar 05 11:00	TB

BTEX/GRO Sample pH < 2

BTEX/GRO SURROGATE RECOVERY: 98 %

BTEX/GRO SURROGATE2 RECOVERY: 102 %

RL = Reporting Limit

Elevated "Less Than Result" (<): @ = Due to sample matrix
! = Due to sample quantity
= Due to sample concentration
+ = Due to extract volume

CERTIFICATION: MN LAB # 027-015-125 WI LAB # 999447680 ND MICRO # 1013-M ND WW/DW # R-040 IA LAB #: 132

MINNESOTA VALLEY TESTING LABORATORIES, INC.
1126 N. Front St. ~ New Ulm, MN 56073 ~ 800-782-3557 ~ Fax 507-359-2890
1411 S. 12th St. ~ Bismarck, ND 58502 ~ 800-279-6885 ~ Fax 701-258-9724
35 W. Lincoln Way ~ Nevada, IA 50201 ~ 800-362-0855 ~ Fax 515-382-3885
www.mvtl.com
MEMBER ACIL

BARRY
EERC-UND
15 N 23RD ST
GRAND FORKS ND 58203

Project Name: PDB
Sample Description: VOC OUT D

Report Date: 31 Mar 05
Lab Number: 05-A6790
Work Order #:82-417
Account #: 007027
Sample Matrix: GROUNDWATER
Date Sampled: 21 Mar 05
Date Received: 22 Mar 05
Chain of Custody Number: 94481
Temp at Receipt: 3.0 C

	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
Benzene	< 1	ppb	1	8021/5030	28 Mar 05 11:00	TB
Toluene	< 1	ppb	1	8021/5030	28 Mar 05 11:00	TB
Ethyl Benzene	< 1	ppb	1	8021/5030	28 Mar 05 11:00	TB
Xylenes (Total)	< 3	ppb	3	8021/5030	28 Mar 05 11:00	TB
GRO (TPH)	< 0.2	mg/L	0.2	8015B/OA1	28 Mar 05 11:00	TB

BTEX/GRO Sample pH < 2

BTEX/GRO SURROGATE RECOVERY: 100 %

BTEX/GRO SURROGATE2 RECOVERY: 101 %

RL = Reporting Limit

Elevated "Less Than Result" (<): @ = Due to sample matrix # = Due to sample concentration
! = Due to sample quantity + = Due to extract volume

CERTIFICATION: MN LAB # 027-015-125 WI LAB # 999447680 ND MICRO # 1013-M ND WW/DW # R-040 IA LAB #: 132

MINNESOTA VALLEY TESTING LABORATORIES, INC.
1126 N. Front St. ~ New Ulm, MN 56073 ~ 800-782-3557 ~ Fax 507-359-2890
1411 S. 12th St. ~ Bismarck, ND 58502 ~ 800-279-6885 ~ Fax 701-258-9724
35 W. Lincoln Way ~ Nevada, IA 50201 ~ 800-362-0855 ~ Fax 515-382-3885
www.mvtl.com
MEMBER ACIL

Report Date: 31 Mar 05
Lab Number: 05-A6791
Work Order #:82-417
Account #: 007027
Sample Matrix: GROUNDWATER
Date Sampled: 21 Mar 05
Date Received: 22 Mar 05
Chain of Custody Number: 94481
Temp at Receipt: 3.0 C

BARRY
EERC-UND
15 N 23RD ST
GRAND FORKS ND 58203

Project Name: PDB
Sample Description: TRIP BLANK

	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
Benzene	< 1	ppb	1	8021/5030	28 Mar 05 11:00	TB
Toluene	< 1	ppb	1	8021/5030	28 Mar 05 11:00	TB
Ethyl Benzene	< 1	ppb	1	8021/5030	28 Mar 05 11:00	TB
Xylenes (Total)	< 3	ppb	3	8021/5030	28 Mar 05 11:00	TB
GRO (TPH)	< 0.2	mg/L	0.2	8015B/OA1	28 Mar 05 11:00	TB

BTEX/GRO Sample pH < 2

BTEX/GRO SURROGATE RECOVERY: 102 %

BTEX/GRO SURROGATE2 RECOVERY: 103 %

RL = Reporting Limit

Elevated "Less Than Result" (<): @ = Due to sample matrix
! = Due to sample quantity
= Due to sample concentration
+ = Due to extract volume

CERTIFICATION: MN LAB # 027-015-125 WI LAB # 999447680 ND MICRO # 1013-M ND WW/DW # R-040 IA LAB #: 132

CHAIN OF CUSTODY RECORD

Page 1 of 1

MVTL LABORATORIES, Inc.
1126 North Front Street
New Ulm, MN 56073
Phone: (507) 354-8517
Toll Free: (800) 782-3557 Fax: (507) 359-2890

PLEASE DO NOT WRITE IN THE SHADED AREAS

W670-677

094481

WORK ORDER # 82-417

MAR. 22. 2005 12:01PM MVTL NEW ULM NO. 8081 P. 2

Company Name and Address:
EERC
P.O. Box 9018
GRAND FORKS ND 58202

Billing Address (indicate name and address if different from above):
-SAME-

Account #: 807027
Contact: BARRY BOTNEN
Name of Sampler:
Quote #:
Project Name/Number: RDF

Phone #: 701 777-5073
Fax #: 701 777-5181
For faxed report check box ☑
Date Submitted: 3/21/05
Purchase Order #:

Lab Use Only	Your Sample I.D. or Number	Sample Description	Type of Sample (Matrix or Substance) Soil	Water	Food	Other (Please Be Specific) Sampled Liquid Layer Not bottom sludge		Analyze For: Vitamin A, TKN, Iron, Calcium BOD, COD, Acetone, Shelf Life
	Example				X			
670	DI IN			✓		3/17-05	1500	BTEX + GRO
671	DI IN D			✓			1505	
685	VOC IN			✓			1510	
86	VOC IN D			✓			1515	
87	DI OUT			✓		3-21	0900	
88	DI OUT D			✓			0905	
89	VOC OUT			✓			910	
90	VOC OUT D			✓			915	
91	TRIP BLANK			✓				

	Transferred by:	Comments: (Sample Condition)	Date / Time	Received by:	Comments: (Sample Condition)	Date / Time	°C
1			3/21/05 1000	Mary D. Fate		22 MAR 05 10:27	3.0C
2							
3							

Disposed of By:

Disposal Comments:

Please submit the top two copies with your samples. We will return the completed original with your results.

MINNESOTA VALLEY TESTING LABORATORIES, INC.

1126 N. Front St. ~ New Ulm, MN 56073 ~ 800-782-3557 ~ Fax 507-359-2890
1411 S. 12th St. ~ Bismarck, ND 58502 ~ 800-279-6885 ~ Fax 701-258-9724
35 W. Lincoln Way ~ Nevada, IA 50201 ~ 800-362-0855 ~ Fax 515-382-3885
www.mvtl.com

MEMBER ACIL

Report Date: 5 Apr 06
Lab Number: 06-A9597
Work Order #:82-436
Account #: 007033
Sample Matrix: GROUNDWATER
Date Sampled: 21 Mar 06 10:30
Date Received: 29 Mar 06
PO #: PASSIVE DIFFUSION BAG

BARRY BOTNEN
ENERGY & ENVIRONMENTAL RESEARCH CTR
UNIVERSITY OF NORTH DAKOTA
GRAND FORKS ND 58203

Project Name: PASSIVE DIFFUSION BAG

Sample Description: DI-IN

Temp at Receipt: 4.0 C

	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
Methyl Tert-Butyl Ether	< 1	ppb	1	8021/5030	30 Mar 06	RDQ
Benzene	< 1	ppb	1	8021/5030	30 Mar 06	RDQ
Toluene	< 1	ppb	1	8021/5030	30 Mar 06	RDQ
Ethyl Benzene	< 1	ppb	1	8021/5030	30 Mar 06	RDQ
Xylenes (Total)	< 3	ppb	3	8021/5030	30 Mar 06	RDQ
GRO (TPH)	< 0.2	mg/L	0.2	8015B/OA1	30 Mar 06	RDQ

BTEX/GRO Sample pH < 2

BTEX SURROGATE RECOVERY: 105 %

GRO SURROGATE RECOVERY: 95 %

RL = Reporting Limit

Elevated "Less Than Result" (<): @ = Due to sample matrix
! = Due to sample quantity
= Due to sample concentration
+ = Due to extract volume

CERTIFICATION: MN LAB # 027-015-125 WI LAB # 999447680 ND MICRO # 1013-M ND WW/DW # R-040 IA LAB #: 132 IA LAB #: 022

MINNESOTA VALLEY TESTING LABORATORIES, INC.
1126 N. Front St. ~ New Ulm, MN 56073 ~ 800-782-3557 ~ Fax 507-359-2890
1411 S. 12th St. ~ Bismarck, ND 58502 ~ 800-279-6885 ~ Fax 701-258-9724
35 W. Lincoln Way ~ Nevada, IA 50201 ~ 800-362-0855 ~ Fax 515-382-3885
www.mvtl.com

BARRY BOTNEN
ENERGY & ENVIRONMENTAL RESEARCH CTR
UNIVERSITY OF NORTH DAKOTA
GRAND FORKS ND 58203

Report Date: 5 Apr 06
Lab Number: 06-A9598
Work Order #:82-436
Account #: 007033
Sample Matrix: GROUNDWATER
Date Sampled: 21 Mar 06 10:35
Date Received: 29 Mar 06
PO #: PASSIVE DIFFUSION BAG

Project Name: PASSIVE DIFFUSION BAG

Sample Description: DI-IN D

Temp at Receipt: 4.0 C

	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
Methyl Tert-Butyl Ether	< 1	ppb	1	8021/5030	30 Mar 06	RDQ
Benzene	< 1	ppb	1	8021/5030	30 Mar 06	RDQ
Toluene	< 1	ppb	1	8021/5030	30 Mar 06	RDQ
Ethyl Benzene	< 1	ppb	1	8021/5030	30 Mar 06	RDQ
Xylenes (Total)	< 3	ppb	3	8021/5030	30 Mar 06	RDQ
GRO (TPH)	< 0.2	mg/L	0.2	8015B/OA1	30 Mar 06	RDQ

BTEX/GRO Sample pH < 2

BTEX SURROGATE RECOVERY: 106 %

GRO SURROGATE RECOVERY: 101 %

RL = Reporting Limit

Elevated "Less Than Result" (<): @ = Due to sample matrix # = Due to sample concentration
! = Due to sample quantity + = Due to extract volume

CERTIFICATION: MN LAB # 027-015-125 WI LAB # 999447680 ND MICRO # 1013-M ND WW/DW # R-040 IA LAB #: 132 IA LAB #: 022

MINNESOTA VALLEY TESTING LABORATORIES, INC.

1126 N. Front St. ~ New Ulm, MN 56073 ~ 800-782-3557 ~ Fax 507-359-2890
1411 S. 12th St. ~ Bismarck, ND 58502 ~ 800-279-6885 ~ Fax 701-258-9724
35 W. Lincoln Way ~ Nevada, IA 50201 ~ 800-362-0855 ~ Fax 515-382-3885
www.mvtl.com

MEMBER ACIL

BARRY BOTNEN
ENERGY & ENVIRONMENTAL RESEARCH CTR
UNIVERSITY OF NORTH DAKOTA
GRAND FORKS ND 58203

Report Date: 5 Apr 06
Lab Number: 06-A9599
Work Order #:82-436
Account #: 007033
Sample Matrix: GROUNDWATER
Date Sampled: 21 Mar 06 10:45
Date Received: 29 Mar 06
PO #: PASSIVE DIFFUSION BAG

Project Name: PASSIVE DIFFUSION BAG

Sample Description: VOC-IN

Temp at Receipt: 4.0 C

	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
Methyl Tert-Butyl Ether	< 10 @	ppb	1	8021/5030	30 Mar 06	RDQ
Benzene	14090	ppb	1.0	8021/5030	31 Mar 06	RDQ
Toluene	549.3	ppb	1.0	8021/5030	30 Mar 06	RDQ
Ethyl Benzene	489.4	ppb	1.0	8021/5030	30 Mar 06	RDQ
Xylenes (Total)	10860	ppb	3.0	8021/5030	31 Mar 06	RDQ
GRO (TPH)	57.04	mg/L	0.200	8015B/OA1	31 Mar 06	RDQ

BTEX/GRO Sample pH < 2

BTEX SURROGATE RECOVERY: 87 %

GRO SURROGATE RECOVERY: 101 %

GRO(TPH) pattern is characteristic of gasoline.
GRO(TPH) matrix spike and matrix spike duplicate recoveries for benzene were out of acceptable range. Matrix spike duplicate recovery for m,p-xylene was out of acceptable range. All other QC was acceptable.

RL = Reporting Limit

Elevated "Less Than Result" (<): @ = Due to sample matrix
! = Due to sample quantity
= Due to sample concentration
+ = Due to extract volume

CERTIFICATION: MN LAB # 027-015-125 WI LAB # 999447680 ND MICRO # 1013-M ND WW/DW # R-040 IA LAB #: 132 IA LAB #: 022

MINNESOTA VALLEY TESTING LABORATORIES, INC.
1126 N. Front St. ~ New Ulm, MN 56073 ~ 800-782-3557 ~ Fax 507-359-2890
1411 S. 12th St. ~ Bismarck, ND 58502 ~ 800-279-6885 ~ Fax 701-258-9724
35 W. Lincoln Way ~ Nevada, IA 50201 ~ 800-362-0855 ~ Fax 515-382-3885
www.mvtl.com

MEMBER ACIL

Report Date: 5 Apr 06
Lab Number: 06-A9600
Work Order #:82-436
Account #: 007033
Sample Matrix: GROUNDWATER
Date Sampled: 21 Mar 06 10:50
Date Received: 29 Mar 06
PO #: PASSIVE DIFFUSION BAG

BARRY BOTNEN
ENERGY & ENVIRONMENTAL RESEARCH CTR
UNIVERSITY OF NORTH DAKOTA
GRAND FORKS ND 58203

Project Name: PASSIVE DIFFUSION BAG

Sample Description: VOC-IN D

Temp at Receipt: 4.0 C

	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
Methyl Tert-Butyl Ether	< 10 @	ppb	1	8021/5030	30 Mar 06	RDQ
Benzene	10150	ppb	1.0	8021/5030	31 Mar 06	RDQ
Toluene	574.4	ppb	1.0	8021/5030	30 Mar 06	RDQ
Ethyl Benzene	460.4	ppb	1.0	8021/5030	30 Mar 06	RDQ
Xylenes (Total)	10740	ppb	3.0	8021/5030	31 Mar 06	RDQ
GRO (TPH)	54.39	mg/L	0.200	8015B/OA1	31 Mar 06	RDQ

BTEX/GRO Sample pH < 2

BTEX SURROGATE RECOVERY: 110 %

GRO SURROGATE RECOVERY: 98 %

GRO(TPH) pattern is characteristic of gasoline.
GRO(TPH) matrix spike and matrix spike duplicate recoveries for benzene were out of acceptable range. Matix spike duplicate recovery for m,p-xylene was out acceptable range. All other QC was acceptable.

RL = Reporting Limit

Elevated "Less Than Result" (<): @ = Due to sample matrix
! = Due to sample quantity
= Due to sample concentration
+ = Due to extract volume

CERTIFICATION: MN LAB # 027-015-125 WI LAB # 999447680 ND MICRO # 1013-M ND WW/DW # R-040 IA LAB #: 132 IA LAB #: 022

MINNESOTA VALLEY TESTING LABORATORIES, INC.
1126 N. Front St. ~ New Ulm, MN 56073 ~ 800-782-3557 ~ Fax 507-359-2890
1411 S. 12th St. ~ Bismarck, ND 58502 ~ 800-279-6885 ~ Fax 701-258-9724
35 W. Lincoln Way ~ Nevada, IA 50201 ~ 800-362-0855 ~ Fax 515-382-3885
www.mvtl.com

BARRY BOTNEN
ENERGY & ENVIRONMENTAL RESEARCH CTR
UNIVERSITY OF NORTH DAKOTA
GRAND FORKS ND 58203

Report Date: 5 Apr 06
Lab Number: 06-A9601
Work Order #:82-436
Account #: 007033
Sample Matrix: GROUNDWATER
Date Sampled: 28 Mar 06 10:30
Date Received: 29 Mar 06
PO #: PASSIVE DIFFUSION BAG

Project Name: PASSIVE DIFFUSION BAG

Sample Description: DI-OUT

Temp at Receipt: 4.0 C

	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
Methyl Tert-Butyl Ether	< 10 @	ppb	1	8021/5030	31 Mar 06	RDQ
Benzene	5290	ppb	1.0	8021/5030	3 Apr 06	RDQ
Toluene	217.0	ppb	1.0	8021/5030	31 Mar 06	RDQ
Ethyl Benzene	164.0	ppb	1.0	8021/5030	31 Mar 06	RDQ
Xylenes (Total)	3616	ppb	3.0	8021/5030	31 Mar 06	RDQ
GRO (TPH)	17.94	mg/L	0.200	8015B/OA1	31 Mar 06	RDQ

BTEX/GRO Sample pH < 2

BTEX SURROGATE RECOVERY: 109 %

GRO SURROGATE RECOVERY: 104 %

GRO(TPH) pattern is characteristic of gasoline.

RL = Reporting Limit

Elevated "Less Than Result" (<): @ = Due to sample matrix # = Due to sample concentration
! = Due to sample quantity + = Due to extract volume

CERTIFICATION: MN LAB # 027-015-125 WI LAB # 999447680 ND MICRO # 1013-M ND WW/DW # R-040 IA LAB #: 132 IA LAB #: 022

MINNESOTA VALLEY TESTING LABORATORIES, INC.

1126 N. Front St. ~ New Ulm, MN 56073 ~ 800-782-3557 ~ Fax 507-359-2890
1411 S. 12th St. ~ Bismarck, ND 58502 ~ 800-279-6885 ~ Fax 701-258-9724
35 W. Lincoln Way ~ Nevada, IA 50201 ~ 800-362-0855 ~ Fax 515-382-3885
www.mvtl.com

MEMBER ACIL

BARRY BOTNEN
ENERGY & ENVIRONMENTAL RESEARCH CTR
UNIVERSITY OF NORTH DAKOTA
GRAND FORKS ND 58203

Report Date: 5 Apr 06
Lab Number: 06-A9602
Work Order #:82-436
Account #: 007033
Sample Matrix: GROUNDWATER
Date Sampled: 28 Mar 06 10:35
Date Received: 29 Mar 06
PO #: PASSIVE DIFFUSION BAG

Project Name: PASSIVE DIFFUSION BAG

Sample Description: DI-OUT D

Temp at Receipt: 4.0 C

	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
Methyl Tert-Butyl Ether	< 10 @	ppb	1	8021/5030	31 Mar 06	RDQ
Benzene	5399	ppb	1.0	8021/5030	3 Apr 06	RDQ
Toluene	221.9	ppb	1.0	8021/5030	31 Mar 06	RDQ
Ethyl Benzene	168.8	ppb	1.0	8021/5030	31 Mar 06	RDQ
Xylenes (Total)	3928	ppb	3.0	8021/5030	31 Mar 06	RDQ
GRO (TPH)	18.84	mg/L	0.200	8015B/OA1	31 Mar 06	RDQ

BTEX/GRO Sample pH < 2

BTEX SURROGATE RECOVERY: 108 %

GRO SURROGATE RECOVERY: 103 %

GRO(TPH) pattern is characteristic of gasoline.

RL = Reporting Limit

Elevated "Less Than Result" (<): @ = Due to sample matrix
! = Due to sample quantity
= Due to sample concentration
+ = Due to extract volume

CERTIFICATION: MN LAB # 027-015-125 WI LAB # 999447680 ND MICRO # 1013-M ND WW/DW # R-040 IA LAB #: 132 IA LAB #: 022

MINNESOTA VALLEY TESTING LABORATORIES, INC.
1126 N. Front St. ~ New Ulm, MN 56073 ~ 800-782-3557 ~ Fax 507-359-2890
1411 S. 12th St. ~ Bismarck, ND 58502 ~ 800-279-6885 ~ Fax 701-258-9724
35 W. Lincoln Way ~ Nevada, IA 50201 ~ 800-362-0855 ~ Fax 515-382-3885
www.mvtl.com

Report Date: 5 Apr 06
Lab Number: 06-A9603
Work Order #:82-436
Account #: 007033
Sample Matrix: GROUNDWATER
Date Sampled: 28 Mar 06 10:45
Date Received: 29 Mar 06
PO #: PASSIVE DIFFUSION BAG

BARRY BOTNEN
ENERGY & ENVIRONMENTAL RESEARCH CTR
UNIVERSITY OF NORTH DAKOTA
GRAND FORKS ND 58203

Project Name: PASSIVE DIFFUSION BAG

Sample Description: VOC-OUT

Temp at Receipt: 4.0 C

	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
Methyl Tert-Butyl Ether	< 10 @	ppb	1	8021/5030	30 Mar 06	RDQ
Benzene	6405	ppb	1.0	8021/5030	31 Mar 06	RDQ
Toluene	274.7	ppb	1.0	8021/5030	30 Mar 06	RDQ
Ethyl Benzene	235.2	ppb	1.0	8021/5030	30 Mar 06	RDQ
Xylenes (Total)	5667	ppb	3.0	8021/5030	31 Mar 06	RDQ
GRO (TPH)	26.98	mg/L	0.200	8015B/OA1	31 Mar 06	RDQ

BTEX/GRO Sample pH < 2

BTEX SURROGATE RECOVERY: 110 %

GRO SURROGATE RECOVERY: 100 %

GRO(TPH) pattern is characteristic of gasoline.
GRO(TPH) matrix spike and matrix spike duplicate recoveries for benzene out of acceptable range. Matrix spike duplicate recovery for m,p-xylene was out of acceptable range. All other QC was acceptable.

RL = Reporting Limit

Elevated "Less Than Result" (<): @ = Due to sample matrix
! = Due to sample quantity
= Due to sample concentration
+ = Due to extract volume

CERTIFICATION: MN LAB # 027-015-125 WI LAB # 999447680 ND MICRO # 1013-M ND WW/DW # R-040 IA LAB #: 132 IA LAB #: 022

MINNESOTA VALLEY TESTING LABORATORIES, INC.

1126 N. Front St. ~ New Ulm, MN 56073 ~ 800-782-3557 ~ Fax 507-359-2890
1411 S. 12th St. ~ Bismarck, ND 58502 ~ 800-279-6885 ~ Fax 701-258-9724
35 W. Lincoln Way ~ Nevada, IA 50201 ~ 800-362-0855 ~ Fax 515-382-3885
www.mvtl.com

MEMBER ACIL

BARRY BOTNEN
ENERGY & ENVIRONMENTAL RESEARCH CTR
UNIVERSITY OF NORTH DAKOTA
GRAND FORKS ND 58203

Report Date: 5 Apr 06
Lab Number: 06-A9604
Work Order #:82-436
Account #: 007033
Sample Matrix: GROUNDWATER
Date Sampled: 28 Mar 06 10:50
Date Received: 29 Mar 06
PO #: PASSIVE DIFFUSION BAG

Project Name: PASSIVE DIFFUSION BAG

Sample Description: VOC-OUT D

Temp at Receipt: 4.0 C

	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
Methyl Tert-Butyl Ether	< 10 @	ppb	1	8021/5030	31 Mar 06	RDQ
Benzene	6621	ppb	1.0	8021/5030	31 Mar 06	RDQ
Toluene	238.4	ppb	1.0	8021/5030	31 Mar 06	RDQ
Ethyl Benzene	224.5	ppb	1.0	8021/5030	31 Mar 06	RDQ
Xylenes (Total)	5620	ppb	3.0	8021/5030	31 Mar 06	RDQ
GRO (TPH)	14.37	mg/L	0.200	8015B/OA1	31 Mar 06	RDQ

BTEX/GRO Sample pH < 2

BTEX SURROGATE RECOVERY: 85 %

GRO SURROGATE RECOVERY: 136 %

GRO(TPH) pattern is characteristic of gasoline.
GRO surrogate BrFB was out of acceptable range due to matrix interference.
GRO(TPH) matrix spike and matrix spike duplicate recoveries for benzene were out of acceptable range. Matrix spike duplicate recovery for m,p-xylene was out of acceptable range. All other QC was acceptable.

RL = Reporting Limit

Elevated "Less Than Result" (<): @ = Due to sample matrix
! = Due to sample quantity
= Due to sample concentration
+ = Due to extract volume

CERTIFICATION: MN LAB # 027-015-125 WI LAB # 999447680 ND MICRO # 1013-M ND WW/DW # R-040 IA LAB #: 132 IA LAB #: 022

MVTL LABORATORIES, Inc.

CHAIN OF CUSTODY RECORD

Page 1 of 1

~~1411 South 12th Street~~ 1126 North Front Street
~~Bismarck, ND 58504~~ New Ulm, MN 56073
~~Phone: (701) 258-9720~~ 800 782-3557
~~Toll Free: (800) 279-6885~~ ~~Fax: (701) 258-9724~~

PLEASE DO NOT WRITE IN THE SHADED AREAS

WORK ORDER # ~~82-436~~ 82-0067

Company Name and Address:
EERC (BARRY BOTNEN)
P.O. BOX 9018
GRAND FORKS, ND 58202

Account #: 007033
Contact: BARRY BOTNEN
Name of Sampler: BARRY BOTNEN
Quote #:
Project Name/Number: PASSIVE DIFFUSION BAG

Phone #: (701) 777-5073
Fax #: (701) 777-5181
For faxed report check box ☒
Date Submitted: 3-28-06
Purchase Order #:

Billing Address (indicate name and address if different from above):
-SAME-

Lab Use Only	Your Sample I.D. or Number	Sample Description	Date / Time	Type of Sample (Matrix or Substance) Soil	Water	Food	Other (Please Be Specific)	Analyze For: Vitamin A, TKN, Iron, Calcium, BOD, COD, Acetone, Shelf Life
	Example	Tank Bottom Tank #3	01/01/99 11:45 a.m.			X	Sampled Liquid Layer Not bottom sludge	
A9597	DI-IN	W595	3-21-06 1030		✓			MRTBX + GRO
98	DI-IN D	W596	3-21-06 1035		✓			* - INCREASED I
99	VOC-IN	W597	3-21-06 1045		✓			MTBE w/ LOW
A9600	VOC-IN D	W598	3-21-06 1050		✓			DETECTION LI
01	DI-OUT	W599	3-28-06 1030		✓			IF POSSIBLE
02	DI-OUT D	W600	3-28-06 1035		✓			CALL SAMPLE
03	VOC-OUT	W601	3-28-06 1045		✓			
04	VOC-OUT D	W602	3-28-06 1050		✓			

	Transferred by:	Comments: (Sample Condition)	Date / Time	Received by:	Comments: (Sample Condition)	Date / Time	°C
1			3-28-06 1200	Mary D. Radle		29 MAR 06 UPS	4.0 C
2							
3							

Disposed of By:

Disposal Comments:

Please submit the top two copies with your samples. We will return the completed original with your results.

MINNESOTA VALLEY TESTING LABORATORIES, INC.
1126 N. Front St. ~ New Ulm, MN 56073 ~ 800-782-3557 ~ Fax 507-359-2890
1411 S. 12th St. ~ Bismarck, ND 58502 ~ 800-279-6885 ~ Fax 701-258-9724
35 W. Lincoln Way ~ Nevada, IA 50201 ~ 800-362-0855 ~ Fax 515-382-3885
www.mvtl.com

MEMBER ACIL

BARRY BOTNEN
ENERGY & ENVIRONMENTAL RESEARCH CTR
UNIVERSITY OF NORTH DAKOTA
GRAND FORKS ND 58203

Project Name: PASSIVE DIFFUSION BAG

Sample Description: DI-OUT

Report Date: 16 May 06
Lab Number: 06-A17653
Work Order #:82-753
Account #: 007033
Sample Matrix: GROUNDWATER
Date Sampled: 5 May 06 9:30
Date Received: 9 May 06
PO #: 30932E
Chain of Custody Number: 2814
Temp at Receipt: 4.0 C

	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
Methyl Tert-Butyl Ether	< 10 #	ppb	1	8021/5030	11 May 06	RDQ
Benzene	3005	ppb	1.0	8021/5030	12 May 06	RDQ
Toluene	82.1	ppb	1.0	8021/5030	11 May 06	RDQ
Ethyl Benzene	35.4	ppb	1.0	8021/5030	11 May 06	RDQ
Xylenes (Total)	2546	ppb	3.0	8021/5030	12 May 06	RDQ
GRO (TPH)	10.12	mg/L	0.200	8015B/OA1	15 May 06	RDQ

BTEX/GRO Sample pH < 2

BTEX SURROGATE RECOVERY: 114 %

GRO SURROGATE RECOVERY: 94 %

GRO(TPH) pattern is characteristic of gasoline.

RL = Reporting Limit

Elevated "Less Than Result" (<): @ = Due to sample matrix # = Due to sample concentration
! = Due to sample quantity + = Due to extract volume

CERTIFICATION: MN LAB # 027-015-125 WI LAB # 999447680 ND MICRO # 1013-M ND WW/DW # R-040 IA LAB #: 132 IA LAB #: 022

MINNESOTA VALLEY TESTING LABORATORIES, INC.

1126 N. Front St. ~ New Ulm, MN 56073 ~ 800-782-3557 ~ Fax 507-359-2890
1411 S. 12th St. ~ Bismarck, ND 58502 ~ 800-279-6885 ~ Fax 701-258-9724
35 W. Lincoln Way ~ Nevada, IA 50201 ~ 800-362-0855 ~ Fax 515-382-3885
www.mvtl.com

MEMBER ACIL

BARRY BOTNEN
ENERGY & ENVIRONMENTAL RESEARCH CTR
UNIVERSITY OF NORTH DAKOTA
GRAND FORKS ND 58203

Project Name: PASSIVE DIFFUSION BAG

Sample Description: DI-OUT D

Report Date: 16 May 06
Lab Number: 06-A17654
Work Order #:82-753
Account #: 007033
Sample Matrix: GROUNDWATER
Date Sampled: 5 May 06 9:35
Date Received: 9 May 06
PO #: 30932E
Chain of Custody Number: 2814
Temp at Receipt: 4.0 C

	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
Methyl Tert-Butyl Ether	< 1	ppb	1	8021/5030	11 May 06	RDQ
Benzene	2925	ppb	1.0	8021/5030	12 May 06	RDQ
Toluene	85.0	ppb	1.0	8021/5030	12 May 06	RDQ
Ethyl Benzene	30.7	ppb	1.0	8021/5030	11 May 06	RDQ
Xylenes (Total)	2388	ppb	3.0	8021/5030	12 May 06	RDQ
GRO (TPH)	11.84	mg/L	0.200	8015B/OA1	12 May 06	RDQ

BTEX/GRO Sample pH < 2

BTEX SURROGATE RECOVERY: 114 %

GRO SURROGATE RECOVERY: 90 %

GRO(TPH) pattern is characteristic of gasoline.

RL = Reporting Limit

Elevated "Less Than Result" (<): @ = Due to sample matrix # = Due to sample concentration
! = Due to sample quantity + = Due to extract volume

CERTIFICATION: MN LAB # 027-015-125 WI LAB # 999447680 ND MICRO # 1013-M ND WW/DW # R-040 IA LAB #: 132 IA LAB #: 022

MINNESOTA VALLEY TESTING LABORATORIES, INC.
1126 N. Front St. ~ New Ulm, MN 56073 ~ 800-782-3557 ~ Fax 507-359-2890
1411 S. 12th St. ~ Bismarck, ND 58502 ~ 800-279-6885 ~ Fax 701-258-9724
35 W. Lincoln Way ~ Nevada, IA 50201 ~ 800-362-0855 ~ Fax 515-382-3885
www.mvtl.com

BARRY BOTNEN
ENERGY & ENVIRONMENTAL RESEARCH CTR
UNIVERSITY OF NORTH DAKOTA
GRAND FORKS ND 58203

Project Name: PASSIVE DIFFUSION BAG

Sample Description: VOC-OUT

Report Date: 16 May 06
Lab Number: 06-A17655
Work Order #:82-753
Account #: 007033
Sample Matrix: GROUNDWATER
Date Sampled: 5 May 06 9:45
Date Received: 9 May 06
PO #: 30932E
Chain of Custody Number: 2814
Temp at Receipt: 4.0 C

	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
Methyl Tert-Butyl Ether	< 10 #	ppb	1	8021/5030	11 May 06	RDQ
Benzene	9548	ppb	1.0	8021/5030	15 May 06	RDQ
Toluene	283.7	ppb	1.0	8021/5030	11 May 06	RDQ
Ethyl Benzene	109.6	ppb	1.0	8021/5030	11 May 06	RDQ
Xylenes (Total)	8814	ppb	3.0	8021/5030	12 May 06	RDQ
GRO (TPH)	41.50	mg/L	0.200	8015B/OA1	12 May 06	RDQ

BTEX/GRO Sample pH < 2

BTEX SURROGATE RECOVERY: 113 %

GRO SURROGATE RECOVERY: 93 %

GRO(TPH) pattern is characteristic of gasoline.

RL = Reporting Limit

Elevated "Less Than Result" (<): @ = Due to sample matrix # = Due to sample concentration
! = Due to sample quantity + = Due to extract volume

CERTIFICATION: MN LAB # 027-015-125 WI LAB # 999447680 ND MICRO # 1013-M ND WW/DW # R-040 IA LAB #: 132 IA LAB #: 022

MINNESOTA VALLEY TESTING LABORATORIES, INC.
1126 N. Front St. ~ New Ulm, MN 56073 ~ 800-782-3557 ~ Fax 507-359-2890
1411 S. 12th St. ~ Bismarck, ND 58502 ~ 800-279-6885 ~ Fax 701-258-9724
35 W. Lincoln Way ~ Nevada, IA 50201 ~ 800-362-0855 ~ Fax 515-382-3885
www.mvtl.com

MEMBER ACIL

BARRY BOTNEN
ENERGY & ENVIRONMENTAL RESEARCH CTR
UNIVERSITY OF NORTH DAKOTA
GRAND FORKS ND 58203

Project Name: PASSIVE DIFFUSION BAG

Sample Description: VOC-OUT D

Report Date: 16 May 06
Lab Number: 06-A17656
Work Order #:82-753
Account #: 007033
Sample Matrix: GROUNDWATER
Date Sampled: 5 May 06 9:50
Date Received: 9 May 06
PO #: 30932E
Chain of Custody Number: 2814
Temp at Receipt: 4.0 C

	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
Methyl Tert-Butyl Ether	< 10 #	ppb	1	8021/5030	11 May 06	RDQ
Benzene	9615	ppb	1.0	8021/5030	15 May 06	RDQ
Toluene	291.8	ppb	1.0	8021/5030	11 May 06	RDQ
Ethyl Benzene	112.9	ppb	1.0	8021/5030	11 May 06	RDQ
Xylenes (Total)	9225	ppb	3.0	8021/5030	12 May 06	RDQ
GRO (TPH)	41.44	mg/L	0.200	8015B/OA1	12 May 06	RDQ

BTEX/GRO Sample pH < 2

BTEX SURROGATE RECOVERY: 111 %

GRO SURROGATE RECOVERY: 93 %

GRO(TPH) pattern is characteristic of gasoline.

RL = Reporting Limit

Elevated "Less Than Result" (<): @ = Due to sample matrix
! = Due to sample quantity
= Due to sample concentration
+ = Due to extract volume

CERTIFICATION: MN LAB # 027-015-125 WI LAB # 999447680 ND MICRO # 1013-M ND WW/DW # R-040 IA LAB #: 132 IA LAB #: 022

MINNESOTA VALLEY TESTING LABORATORIES, INC.
1126 N. Front St. ~ New Ulm, MN 56073 ~ 800-782-3557 ~ Fax 507-359-2890
1411 S. 12th St. ~ Bismarck, ND 58502 ~ 800-279-6885 ~ Fax 701-258-9724
35 W. Lincoln Way ~ Nevada, IA 50201 ~ 800-362-0855 ~ Fax 515-382-3885
www.mvtl.com

MEMBER ACIL

BARRY BOTNEN
ENERGY & ENVIRONMENTAL RESEARCH CTR
UNIVERSITY OF NORTH DAKOTA
GRAND FORKS ND 58203

Project Name: PASSIVE DIFFUSION BAG

Sample Description: DI-IN

Report Date: 16 May 06
Lab Number: 06-A17657
Work Order #:82-753
Account #: 007033
Sample Matrix: GROUNDWATER
Date Sampled: 3 May 06 9:45
Date Received: 9 May 06
PO #: 30932E
Chain of Custody Number: 2814
Temp at Receipt: 4.0 C

	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
Methyl Tert-Butyl Ether	< 1	ppb	1	8021/5030	11 May 06	RDQ
Benzene	< 1	ppb	1	8021/5030	11 May 06	RDQ
Toluene	< 1	ppb	1	8021/5030	11 May 06	RDQ
Ethyl Benzene	< 1	ppb	1	8021/5030	11 May 06	RDQ
Xylenes (Total)	< 3	ppb	3	8021/5030	11 May 06	RDQ
GRO (TPH)	< 0.2	mg/L	0.2	8015B/OA1	11 May 06	RDQ

BTEX/GRO Sample pH < 2

BTEX SURROGATE RECOVERY: 109 %

GRO SURROGATE RECOVERY: 87 %

RL = Reporting Limit

Elevated "Less Than Result" (<): @ = Due to sample matrix # = Due to sample concentration
! = Due to sample quantity + = Due to extract volume

CERTIFICATION: MN LAB # 027-015-125 WI LAB # 999447680 ND MICRO # 1013-M ND WW/DW # R-040 IA LAB #: 132 IA LAB #: 022

MINNESOTA VALLEY TESTING LABORATORIES, INC.
1126 N. Front St. ~ New Ulm, MN 56073 ~ 800-782-3557 ~ Fax 507-359-2890
1411 S. 12th St. ~ Bismarck, ND 58502 ~ 800-279-6885 ~ Fax 701-258-9724
35 W. Lincoln Way ~ Nevada, IA 50201 ~ 800-362-0855 ~ Fax 515-382-3885
www.mvtl.com

MEMBER ACIL

BARRY BOTNEN
ENERGY & ENVIRONMENTAL RESEARCH CTR
UNIVERSITY OF NORTH DAKOTA
GRAND FORKS ND 58203

Project Name: PASSIVE DIFFUSION BAG

Sample Description: DI-IN D

Report Date: 16 May 06
Lab Number: 06-A17658
Work Order #:82-753
Account #: 007033
Sample Matrix: GROUNDWATER
Date Sampled: 3 May 06 9:50
Date Received: 9 May 06
PO #: 30932E
Chain of Custody Number: 2814
Temp at Receipt: 4.0 C

	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
Methyl Tert-Butyl Ether	< 1	ppb	1	8021/5030	11 May 06	RDQ
Benzene	< 1	ppb	1	8021/5030	11 May 06	RDQ
Toluene	< 1	ppb	1	8021/5030	11 May 06	RDQ
Ethyl Benzene	< 1	ppb	1	8021/5030	11 May 06	RDQ
Xylenes (Total)	< 3	ppb	3	8021/5030	11 May 06	RDQ
GRO (TPH)	< 0.2	mg/L	0.2	8015B/OA1	11 May 06	RDQ

BTEX/GRO Sample pH < 2

BTEX SURROGATE RECOVERY: 108 %

GRO SURROGATE RECOVERY: 88 %

RL = Reporting Limit

Elevated "Less Than Result" (<): @ = Due to sample matrix # = Due to sample concentration
! = Due to sample quantity + = Due to extract volume

CERTIFICATION: MN LAB # 027-015-125 WI LAB # 999447680 ND MICRO # 1013-M ND WW/DW # R-040 IA LAB #: 132 IA LAB #: 022

MINNESOTA VALLEY TESTING LABORATORIES, INC.
1126 N. Front St. ~ New Ulm, MN 56073 ~ 800-782-3557 ~ Fax 507-359-2890
1411 S. 12th St. ~ Bismarck, ND 58502 ~ 800-279-6885 ~ Fax 701-258-9724
35 W. Lincoln Way ~ Nevada, IA 50201 ~ 800-362-0855 ~ Fax 515-382-3885
www.mvtl.com

MEMBER ACIL

BARRY BOTNEN
ENERGY & ENVIRONMENTAL RESEARCH CTR
UNIVERSITY OF NORTH DAKOTA
GRAND FORKS ND 58203

Project Name: PASSIVE DIFFUSION BAG

Sample Description: VOC-IN

Report Date: 16 May 06
Lab Number: 06-A17659
Work Order #:82-753
Account #: 007033
Sample Matrix: GROUNDWATER
Date Sampled: 3 May 06 9:30
Date Received: 9 May 06
PO #: 30932E
Chain of Custody Number: 2814
Temp at Receipt: 4.0 C

	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
Methyl Tert-Butyl Ether	< 10 #	ppb	1	8021/5030	11 May 06	RDQ
Benzene	13330	ppb	1.0	8021/5030	15 May 06	RDQ
Toluene	391.1	ppb	1.0	8021/5030	11 May 06	RDQ
Ethyl Benzene	154.7	ppb	1.0	8021/5030	11 May 06	RDQ
Xylenes (Total)	11350	ppb	3.0	8021/5030	12 May 06	RDQ
GRO (TPH)	54.26	mg/L	0.200	8015B/OA1	12 May 06	RDQ

BTEX/GRO Sample pH < 2

BTEX SURROGATE RECOVERY: 112 %

GRO SURROGATE RECOVERY: 94 %

GRO(TPH) pattern is characteristic of gasoline.

RL = Reporting Limit

Elevated "Less Than Result" (<): @ = Due to sample matrix # = Due to sample concentration
! = Due to sample quantity + = Due to extract volume

CERTIFICATION: MN LAB # 027-015-125 WI LAB # 999447680 ND MICRO # 1013-M ND WW/DW # R-040 IA LAB #: 132 IA LAB #: 022

MINNESOTA VALLEY TESTING LABORATORIES, INC.
1126 N. Front St. ~ New Ulm, MN 56073 ~ 800-782-3557 ~ Fax 507-359-2890
1411 S. 12th St. ~ Bismarck, ND 58502 ~ 800-279-6885 ~ Fax 701-258-9724
35 W. Lincoln Way ~ Nevada, IA 50201 ~ 800-362-0855 ~ Fax 515-382-3885
www.mvtl.com

MEMBER ACIL

BARRY BOTNEN
EERC-UND
15 N 23RD ST
GRAND FORKS ND 58203

Project Name: PASSIVE DIFFUSION BAG

Sample Description: VOC-IN D

Report Date: 16 May 06
Lab Number: 06-A17660
Work Order #:82-753
Account #: 007027
Sample Matrix: GROUNDWATER
Date Sampled: 3 May 06 9:35
Date Received: 9 May 06
PO #: 30932E
Chain of Custody Number: 2814
Temp at Receipt: 4.0 C

	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
Methyl Tert-Butyl Ether	< 10 #	ppb	1	8021/5030	11 May 06	RDQ
Benzene	13340	ppb	1.0	8021/5030	15 May 06	RDQ
Toluene	398.3	ppb	1.0	8021/5030	11 May 06	RDQ
Ethyl Benzene	156.0	ppb	1.0	8021/5030	11 May 06	RDQ
Xylenes (Total)	12000	ppb	3.0	8021/5030	12 May 06	RDQ
GRO (TPH)	57.25	mg/L	0.200	8015B/OA1	12 May 06	RDQ

BTEX/GRO Sample pH < 2

BTEX SURROGATE RECOVERY: 110 %

GRO SURROGATE RECOVERY: 95 %

GRO(TPH) pattern is characteristic of gasoline.

RL = Reporting Limit

Elevated "Less Than Result" (<): @ = Due to sample matrix # = Due to sample concentration
! = Due to sample quantity + = Due to extract volume

CERTIFICATION: MN LAB # 027-015-125 WI LAB # 999447680 ND MICRO # 1013-M ND WW/DW # R-040 IA LAB #: 132 IA LAB #: 022

MINNESOTA VALLEY TESTING LABORATORIES, INC.
1126 N. Front St. ~ New Ulm, MN 56073 ~ 800-782-3557 ~ Fax 507-359-2890
1411 S. 12th St. ~ Bismarck, ND 58502 ~ 800-279-6885 ~ Fax 701-258-9724
35 W. Lincoln Way ~ Nevada, IA 50201 ~ 800-362-0855 ~ Fax 515-382-3885
www.mvtl.com

MEMBER ACIL

Report Date: 16 May 06
Lab Number: 06-A17661
Work Order #:82-753
Account #: 007033
Sample Matrix: GROUNDWATER
Date Sampled: 3 May 06
Date Received: 9 May 06
PO #: 30932E
Chain of Custody Number: 2814
Temp at Receipt: 4.0 C

BARRY BOTNEN
ENERGY & ENVIRONMENTAL RESEARCH CTR
UNIVERSITY OF NORTH DAKOTA
GRAND FORKS ND 58203

Project Name: PASSIVE DIFFUSION BAG

Sample Description: TRIP BLANK

	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
Methyl Tert-Butyl Ether	< 1	ppb	1	8021/5030	11 May 06	RDQ
Benzene	< 1	ppb	1	8021/5030	11 May 06	RDQ
Toluene	< 1	ppb	1	8021/5030	11 May 06	RDQ
Ethyl Benzene	< 1	ppb	1	8021/5030	11 May 06	RDQ
Xylenes (Total)	< 3	ppb	3	8021/5030	11 May 06	RDQ
GRO (TPH)	< 0.2	mg/L	0.2	8015B/OA1	11 May 06	RDQ

** No collection time supplied by the client.

BTEX/GRO Sample pH < 2

BTEX SURROGATE RECOVERY: 111 %

GRO SURROGATE RECOVERY: 86 %

RL = Reporting Limit

Elevated "Less Than Result" (<): @ = Due to sample matrix # = Due to sample concentration
! = Due to sample quantity + = Due to extract volume

CERTIFICATION: MN LAB # 027-015-125 WI LAB # 999447680 ND MICRO # 1013-M ND WW/DW # R-040 IA LAB #: 132 IA LAB #: 022

CHAIN OF CUSTODY RECORD

Page 1 of 1

MVTL LABORATORIES, Inc.
~~1411 South 12th Street~~
~~Bismarck, ND 58504~~
~~Phone: (701) 258-9720~~
Toll Free: (800) 279-6885 Fax: (701) 258-9724

1126 N. FRONT ST.
NEW ULM, MN 56073

PLEASE DO NOT WRITE IN THE SHADED AREAS

$80.00

W1435
-1448

No 2814

82-753

WORK ORDER # ~~22-0175~~

Company Name and Address: EERC (BARRY BOTNEN) P.O. BOX 9018 GRAND FORKS, ND 58202	Account #: 7033
	Contact: B. BOTNEN
	Name of Sampler: B. BOTNEN
	Quote #:
	Project Name/Number: PASSIVE DIFFUSION BAG
Billing Address (indicate name and address if different from above): -SAME-	Phone #: (701) 777-5073
	Fax #: (701) 777-5781
	For faxed report check box ☒
	Date Submitted: 5-8-06
	Purchase Order #: 30932 E

Lab Use Only	Your Sample I.D. or Number	Sample Description	Date / Time	Type of Sample (Matrix or Substance) Soil	Water	Food	Other (Please Be Specific)	Analyze For: Vitamin A, TKN, Iron, Calcium BOD, COD, Acetone, Shelf Life
	Example	Tank Bottom Tank #3	01/01/99 11:45 a.m.			X	Sampled Liquid Layer Not bottom sludge	
A17653	DI-OUT		5/5/06 0726		X			MBTEX + GRO
54	DI-OUT D		5/5/06 0735		X			
55	VOC-OUT		5/5/06 0745		X			
56	VOC-OUT D		5/5/06 0750		X			
57	DI-IN		5/3/06 0745		X			
58	DI-IN D		5/3/06 0750		X			
59	VOC-IN		5/3/06 0730		X			
60	VOC-IN D		5/3/06 0735		X			
61	Trip							

** INTERESTED IN ANY LOW LEVEL MBTEX

	Transferred by:	Comments: (Sample Condition)	Date / Time	Received by:	Comments: (Sample Condition)	Date / Time	°C
1			5/4/06 0930	Mary D. Loobe			4.0C
2							
3							

Disposed of By: Disposal Comments:

Please submit the top two copies with your samples. We will return the completed original with your results.

MINNESOTA VALLEY TESTING LABORATORIES, INC.

1126 N. Front St. ~ New Ulm, MN 56073 ~ 800-782-3557 ~ Fax 507-359-2890
1411 S. 12th St. ~ Bismarck, ND 58502 ~ 800-279-6885 ~ Fax 701-258-9724
35 W. Lincoln Way ~ Nevada, IA 50201 ~ 800-362-0855 ~ Fax 515-382-3885
www.mvtl.com

MEMBER ACIL

Report Date: 30 May 06
Lab Number: 06-A19411
Work Order #:82-821
Account #: 007033
Sample Matrix: GROUNDWATER
Date Sampled: 9 May 06 10:00
Date Received: 17 May 06

Temp at Receipt: 3.0 C

BARRY BOTNEN
ENERGY & ENVIRONMENTAL RESEARCH CTR
UNIVERSITY OF NORTH DAKOTA
GRAND FORKS ND 58203

Project Name: PASSIVE DIFFUSION BAG
Sample Description: DI-IN

	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
Methyl Tert-Butyl Ether	< 1	ppb	1	8021/5030	19 May 06	RDQ
Benzene	< 1	ppb	1	8021/5030	19 May 06	RDQ
Toluene	< 1	ppb	1	8021/5030	19 May 06	RDQ
Ethyl Benzene	< 1	ppb	1	8021/5030	19 May 06	RDQ
Xylenes (Total)	< 3	ppb	3	8021/5030	19 May 06	RDQ
GRO (TPH)	< 0.2	mg/L	0.2	8015B/OA1	19 May 06	RDQ

BTEX/GRO Sample pH < 2

BTEX SURROGATE RECOVERY: 105 %

GRO SURROGATE RECOVERY: 85 %

RL = Reporting Limit

Elevated "Less Than Result" (<): @ = Due to sample matrix # = Due to sample concentration
! = Due to sample quantity + = Due to extract volume

CERTIFICATION: MN LAB # 027-015-125 WI LAB # 999447680 ND MICRO # 1013-M ND WW/DW # R-040 IA LAB #: 132 IA LAB #: 022

MINNESOTA VALLEY TESTING LABORATORIES, INC.

1126 N. Front St. ~ New Ulm, MN 56073 ~ 800-782-3557 ~ Fax 507-359-2890
1411 S. 12th St. ~ Bismarck, ND 58502 ~ 800-279-6885 ~ Fax 701-258-9724
35 W. Lincoln Way ~ Nevada, IA 50201 ~ 800-362-0855 ~ Fax 515-382-3885
www.mvtl.com

MEMBER ACIL

Report Date: 30 May 06
Lab Number: 06-A19412
Work Order #:82-821
Account #: 007033
Sample Matrix: GROUNDWATER
Date Sampled: 9 May 06 10:05
Date Received: 17 May 06

Temp at Receipt: 3.0 C

BARRY BOTNEN
ENERGY & ENVIRONMENTAL RESEARCH CTR
UNIVERSITY OF NORTH DAKOTA
GRAND FORKS ND 58203

Project Name: PASSIVE DIFFUSION BAG
Sample Description: DI-IND

	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
Methyl Tert-Butyl Ether	< 1	ppb	1	8021/5030	19 May 06	RDQ
Benzene	< 1	ppb	1	8021/5030	19 May 06	RDQ
Toluene	< 1	ppb	1	8021/5030	19 May 06	RDQ
Ethyl Benzene	< 1	ppb	1	8021/5030	19 May 06	RDQ
Xylenes (Total)	< 3	ppb	3	8021/5030	19 May 06	RDQ
GRO (TPH)	< 0.2	mg/L	0.2	8015B/OA1	19 May 06	RDQ

BTEX/GRO Sample pH < 2

BTEX SURROGATE RECOVERY: 105 %

GRO SURROGATE RECOVERY: 85 %

RL = Reporting Limit

Elevated "Less Than Result" (<): @ = Due to sample matrix
! = Due to sample quantity
= Due to sample concentration
+ = Due to extract volume

CERTIFICATION: MN LAB # 027-015-125 WI LAB # 999447680 ND MICRO # 1013-M ND WW/DW # R-040 IA LAB #: 132 IA LAB #: 022

MINNESOTA VALLEY TESTING LABORATORIES, INC.
1126 N. Front St. ~ New Ulm, MN 56073 ~ 800-782-3557 ~ Fax 507-359-2890
1411 S. 12th St. ~ Bismarck, ND 58502 ~ 800-279-6885 ~ Fax 701-258-9724
35 W. Lincoln Way ~ Nevada, IA 50201 ~ 800-362-0855 ~ Fax 515-382-3885
www.mvtl.com

MEMBER ACIL

Report Date: 30 May 06
Lab Number: 06-A19413
Work Order #:82-821
Account #: 007033
Sample Matrix: GROUNDWATER
Date Sampled: 9 May 06 10:30
Date Received: 17 May 06

Temp at Receipt: 3.0 C

BARRY BOTNEN
ENERGY & ENVIRONMENTAL RESEARCH CTR
UNIVERSITY OF NORTH DAKOTA
GRAND FORKS ND 58203

Project Name: PASSIVE DIFFUSION BAG
Sample Description: VOC-IN

	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
Methyl Tert-Butyl Ether	< 200 #	ppb	1	8021/5030	19 May 06	RDQ
Benzene	6385	ppb	1.0	8021/5030	19 May 06	RDQ
Toluene	9151	ppb	1.0	8021/5030	19 May 06	RDQ
Ethyl Benzene	1166	ppb	1.0	8021/5030	19 May 06	RDQ
Xylenes (Total)	6165	ppb	3.0	8021/5030	19 May 06	RDQ
GRO (TPH)	55.22	mg/L	0.200	8015B/OA1	19 May 06	RDQ

BTEX/GRO Sample pH < 2

BTEX SURROGATE RECOVERY: 106 %

GRO SURROGATE RECOVERY: 88 %

RL = Reporting Limit

Elevated "Less Than Result" (<): @ = Due to sample matrix # = Due to sample concentration
! = Due to sample quantity + = Due to extract volume

CERTIFICATION: MN LAB # 027-015-125 WI LAB # 999447680 ND MICRO # 1013-M ND WW/DW # R-040 IA LAB #: 132 IA LAB #: 022

MINNESOTA VALLEY TESTING LABORATORIES, INC.
1126 N. Front St. ~ New Ulm, MN 56073 ~ 800-782-3557 ~ Fax 507-359-2890
1411 S. 12th St. ~ Bismarck, ND 58502 ~ 800-279-6885 ~ Fax 701-258-9724
35 W. Lincoln Way ~ Nevada, IA 50201 ~ 800-362-0855 ~ Fax 515-382-3885
www.mvtl.com

MEMBER ACIL

Report Date: 30 May 06
Lab Number: 06-A19414
Work Order #:82-821
Account #: 007033
Sample Matrix: GROUNDWATER
Date Sampled: 9 May 06 10:35
Date Received: 17 May 06

Temp at Receipt: 3.0 C

BARRY BOTNEN
ENERGY & ENVIRONMENTAL RESEARCH CTR
UNIVERSITY OF NORTH DAKOTA
GRAND FORKS ND 58203

Project Name: PASSIVE DIFFUSION BAG
Sample Description: VOC-IN D

	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
Methyl Tert-Butyl Ether	< 200 #	ppb	1	8021/5030	19 May 06	RDQ
Benzene	6134	ppb	1.0	8021/5030	19 May 06	RDQ
Toluene	8880	ppb	1.0	8021/5030	19 May 06	RDQ
Ethyl Benzene	1113	ppb	1.0	8021/5030	19 May 06	RDQ
Xylenes (Total)	5984	ppb	3.0	8021/5030	19 May 06	RDQ
GRO (TPH)	55.57	mg/L	0.200	8015B/OA1	19 May 06	RDQ

BTEX/GRO Sample pH < 2

BTEX SURROGATE RECOVERY: 102 %

GRO SURROGATE RECOVERY: 93 %

RL = Reporting Limit

Elevated "Less Than Result" (<): @ = Due to sample matrix # = Due to sample concentration
! = Due to sample quantity + = Due to extract volume

CERTIFICATION: MN LAB # 027-015-125 WI LAB # 999447680 ND MICRO # 1013-M ND WW/DW # R-040 IA LAB #: 132 IA LAB #: 022

MINNESOTA VALLEY TESTING LABORATORIES, INC.
1126 N. Front St. ~ New Ulm, MN 56073 ~ 800-782-3557 ~ Fax 507-359-2890
1411 S. 12th St. ~ Bismarck, ND 58502 ~ 800-279-6885 ~ Fax 701-258-9724
35 W. Lincoln Way ~ Nevada, IA 50201 ~ 800-362-0855 ~ Fax 515-382-3885
www.mvtl.com

MEMBER ACIL

Report Date: 30 May 06
Lab Number: 06-A19415
Work Order #:82-821
Account #: 007033
Sample Matrix: GROUNDWATER
Date Sampled: 16 May 06 10:00
Date Received: 17 May 06

Temp at Receipt: 3.0 C

BARRY BOTNEN
ENERGY & ENVIRONMENTAL RESEARCH CTR
UNIVERSITY OF NORTH DAKOTA
GRAND FORKS ND 58203

Project Name: PASSIVE DIFFUSION BAG
Sample Description: DI-OUT

	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
Methyl Tert-Butyl Ether	< 20 #	ppb	1	8021/5030	24 May 06	RDQ
Benzene	1868	ppb	1.0	8021/5030	24 May 06	RDQ
Toluene	2559	ppb	1.0	8021/5030	26 May 06	RDQ
Ethyl Benzene	237.0	ppb	1.0	8021/5030	24 May 06	RDQ
Xylenes (Total)	1727	ppb	3.0	8021/5030	24 May 06	RDQ
GRO (TPH)	13.65	mg/L	0.200	8015B/OA1	24 May 06	RDQ

BTEX/GRO Sample pH < 2

BTEX SURROGATE RECOVERY: 105 %

GRO SURROGATE RECOVERY: 89 %

GRO(TPH) pattern is characteristic of gasoline.

RL = Reporting Limit

Elevated "Less Than Result" (<): @ = Due to sample matrix # = Due to sample concentration
! = Due to sample quantity + = Due to extract volume

CERTIFICATION: MN LAB # 027-015-125 WI LAB # 999447680 ND MICRO # 1013-M ND WW/DW # R-040 IA LAB #: 132 IA LAB #: 022

MINNESOTA VALLEY TESTING LABORATORIES, INC.
1126 N. Front St. ~ New Ulm, MN 56073 ~ 800-782-3557 ~ Fax 507-359-2890
1411 S. 12th St. ~ Bismarck, ND 58502 ~ 800-279-6885 ~ Fax 701-258-9724
35 W. Lincoln Way ~ Nevada, IA 50201 ~ 800-362-0855 ~ Fax 515-382-3885
www.mvtl.com
MEMBER ACIL

BARRY BOTNEN
ENERGY & ENVIRONMENTAL RESEARCH CTR
UNIVERSITY OF NORTH DAKOTA
GRAND FORKS ND 58203

Report Date: 30 May 06
Lab Number: 06-A19416
Work Order #:82-821
Account #: 007033
Sample Matrix: GROUNDWATER
Date Sampled: 16 May 06 10:05
Date Received: 17 May 06

Project Name: PASSIVE DIFFUSION BAG
Sample Description: DI-OUT D

Temp at Receipt: 3.0 C

	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
Methyl Tert-Butyl Ether	< 20 #	ppb	1	8021/5030	24 May 06	RDQ
Benzene	1854	ppb	1.0	8021/5030	24 May 06	RDQ
Toluene	2552	ppb	1.0	8021/5030	26 May 06	RDQ
Ethyl Benzene	231.6	ppb	1.0	8021/5030	24 May 06	RDQ
Xylenes (Total)	1688	ppb	3.0	8021/5030	24 May 06	RDQ
GRO (TPH)	13.78	mg/L	0.200	8015B/OA1	24 May 06	RDQ

BTEX/GRO Sample pH < 2

BTEX SURROGATE RECOVERY: 106 %

GRO SURROGATE RECOVERY: 89 %

GRO(TPH) pattern is characteristic of gasoline.

RL = Reporting Limit

Elevated "Less Than Result" (<): @ = Due to sample matrix # = Due to sample concentration
! = Due to sample quantity + = Due to extract volume

CERTIFICATION: MN LAB # 027-015-125 WI LAB # 999447680 ND MICRO # 1013-M ND WW/DW # R-040 IA LAB #: 132 IA LAB #: 022

MINNESOTA VALLEY TESTING LABORATORIES, INC.
1126 N. Front St. ~ New Ulm, MN 56073 ~ 800-782-3557 ~ Fax 507-359-2890
1411 S. 12th St. ~ Bismarck, ND 58502 ~ 800-279-6885 ~ Fax 701-258-9724
35 W. Lincoln Way ~ Nevada, IA 50201 ~ 800-362-0855 ~ Fax 515-382-3885
www.mvtl.com

MEMBER ACIL

Report Date: 30 May 06
Lab Number: 06-A19417
Work Order #:82-821
Account #: 007033
Sample Matrix: GROUNDWATER
Date Sampled: 16 May 06 10:30
Date Received: 17 May 06

Temp at Receipt: 3.0 C

BARRY BOTNEN
ENERGY & ENVIRONMENTAL RESEARCH CTR
UNIVERSITY OF NORTH DAKOTA
GRAND FORKS ND 58203

Project Name: PASSIVE DIFFUSION BAG
Sample Description: VOC-OUT

	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
Methyl Tert-Butyl Ether	< 100 #	ppb	1	8021/5030	24 May 06	RDQ
Benzene	2966	ppb	1.0	8021/5030	24 May 06	RDQ
Toluene	4062	ppb	1.0	8021/5030	24 May 06	RDQ
Ethyl Benzene	180.0	ppb	1.0	8021/5030	24 May 06	RDQ
Xylenes (Total)	3058	ppb	3.0	8021/5030	24 May 06	RDQ
GRO (TPH)	25.39	mg/L	0.200	8015B/OA1	24 May 06	RDQ

BTEX/GRO Sample pH < 2

BTEX SURROGATE RECOVERY: 108 %

GRO SURROGATE RECOVERY: 86 %

GRO(TPH) pattern is characteristic of gasoline.

RL = Reporting Limit

Elevated "Less Than Result" (<): @ = Due to sample matrix # = Due to sample concentration
! = Due to sample quantity + = Due to extract volume

CERTIFICATION: MN LAB # 027-015-125 WI LAB # 999447680 ND MICRO # 1013-M ND WW/DW # R-040 IA LAB #: 132 IA LAB #: 022

MINNESOTA VALLEY TESTING LABORATORIES, INC.

1126 N. Front St. ~ New Ulm, MN 56073 ~ 800-782-3557 ~ Fax 507-359-2890
1411 S. 12th St. ~ Bismarck, ND 58502 ~ 800-279-6885 ~ Fax 701-258-9724
35 W. Lincoln Way ~ Nevada, IA 50201 ~ 800-362-0855 ~ Fax 515-382-3885
www.mvtl.com

MEMBER ACIL

Report Date: 30 May 06
Lab Number: 06-A19418
Work Order #:82-821
Account #: 007033
Sample Matrix: GROUNDWATER
Date Sampled: 16 May 06 10:35
Date Received: 17 May 06

Temp at Receipt: 3.0 C

BARRY BOTNEN
ENERGY & ENVIRONMENTAL RESEARCH CTR
UNIVERSITY OF NORTH DAKOTA
GRAND FORKS ND 58203

Project Name: PASSIVE DIFFUSION BAG
Sample Description: VOC-OUT D

	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
Methyl Tert-Butyl Ether	< 100 #	ppb	1	8021/5030	24 May 06	RDQ
Benzene	2736	ppb	1.0	8021/5030	24 May 06	RDQ
Toluene	4059	ppb	1.0	8021/5030	24 May 06	RDQ
Ethyl Benzene	181.1	ppb	1.0	8021/5030	24 May 06	RDQ
Xylenes (Total)	2979	ppb	3.0	8021/5030	24 May 06	RDQ
GRO (TPH)	24.31	mg/L	0.200	8015B/OA1	24 May 06	RDQ

BTEX/GRO Sample pH < 2

BTEX SURROGATE RECOVERY: 104 %

GRO SURROGATE RECOVERY: 88 %

GRO(TPH) pattern is characteristic of gasoline.

RL = Reporting Limit

Elevated "Less Than Result" (<): @ = Due to sample matrix # = Due to sample concentration
! = Due to sample quantity + = Due to extract volume

CERTIFICATION: MN LAB # 027-015-125 WI LAB # 999447680 ND MICRO # 1013-M ND WW/DW # R-040 IA LAB #: 132 IA LAB #: 022

W1600-1607

CHAIN OF CUSTODY RECORD

Page 1 of 1

MVTL LABORATORIES, Inc.
~~1411 South 12th Street~~ 1126 N. FRONT ST
~~Bismarck, ND 58504~~ NEW ULM, MN 56073
Phone: (701) 258-9720
Toll Free: (800) 279-6885 Fax: (701) 258-9724

PLEASE DO NOT WRITE IN THE SHADED AREAS

WORK ORDER # 82-821

NO. 0834 P. 1

MAY. 17. 2006 11:19AM MVTL-NEW ULM 5073592890

Company Name and Address: EERC (BARRY BOTHEN) P.O. BOX 9018 GRAND FORKS, ND 58202	Account #: 007033
	Contact: B. BOTHEN
	Name of Sampler: B. BOTHEN
Billing Address (indicate name and address if different from above): SAME.	Quote #:
	Project Name/Number: PASSIVE DIFFUSION BAG
	Phone #: 701 777-5073
	Fax #: 701 777-5181 For faxed report check box ☒
	Date Submitted: 5/16/06
	Purchase Order #:

Lab Use Only	Your Sample I.D. or Number	Sample Description	Date / Time	Type of Sample (Matrix or Substance) Soil	Water	Food	Other (Please Be Specific)	Analyze For: Vitamin A, TKN, Iron, Calcium, BOD, COD, Acetone, Shelf Life
	1 Example	Tank Bottom Tank #3	01/01/99 11:45 a.m.			X	Sampled Liquid Layer Not bottom sludge	
	12 DI-IN		5-9-06 1040		V			MTBEX + GRO (TPH)
	13 DI-IN D		5-9-06 1045		/			
	14 VOC-IN		5-9-06 1030		/			* SUGGESTED *
	15 VOC-IN D		5-9-06 1035		/			LOW LEVELS OF
	16 DI-OUT		5-16-06 1000		/			MTBE.
	17 DI-OUT D		5-16-06 1005		/			
	18 VOC-OUT		5-16-06 1030		V			
	19 VOC-OUT D		5-16-06 1035		V			

	Transferred by:	Comments: (Sample Condition)	Date / Time	Received by:	Comments: (Sample Condition)	Date / Time	°C
1			5/16/06 1100	Mary D. Lader		17 MAY 06 1053	3.0 C
2							
3							

Disposed of By: Disposal Comments:

Please submit the top two copies with your samples. We will return the completed original with your results.

MINNESOTA VALLEY TESTING LABORATORIES, INC.
1126 N. Front St. ~ New Ulm, MN 56073 ~ 800-782-3557 ~ Fax 507-359-2890
1411 S. 12th St. ~ Bismarck, ND 58502 ~ 800-279-6885 ~ Fax 701-258-9724
35 W. Lincoln Way ~ Nevada, IA 50201 ~ 800-362-0855 ~ Fax 515-382-3885
www.mvtl.com

Report Date: 5 Jun 06
Lab Number: 06-A20652
Work Order #:82-914
Account #: 007033
Sample Matrix: GROUNDWATER
Date Sampled: 19 May 06 10:00
Date Received: 24 May 06
PO #: PDB

BARRY BOTNEN
ENERGY & ENVIRONMENTAL RESEARCH CTR
UNIVERSITY OF NORTH DAKOTA
GRAND FORKS ND 58203

Project Name: PDB

Sample Description: DI-IN 5-19-06

Temp at Receipt: 4.0 C

	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
Methyl Tert-Butyl Ether	< 1	ppb	1	8021/5030	30 May 06	RDQ
Benzene	< 1	ppb	1	8021/5030	30 May 06	RDQ
Toluene	< 1	ppb	1	8021/5030	30 May 06	RDQ
Ethyl Benzene	< 1	ppb	1	8021/5030	30 May 06	RDQ
Xylenes (Total)	< 3	ppb	3	8021/5030	30 May 06	RDQ
GRO (TPH)	< 0.2	mg/L	0.2	8015B/OA1	30 May 06	RDQ

BTEX/GRO Sample pH < 2

BTEX SURROGATE RECOVERY: 105 %

GRO SURROGATE RECOVERY: 85 %

RL = Reporting Limit

Elevated "Less Than Result" (<): @ = Due to sample matrix # = Due to sample concentration
! = Due to sample quantity + = Due to extract volume

CERTIFICATION: MN LAB # 027-015-125 WI LAB # 999447680 ND MICRO # 1013-M ND WW/DW # R-040 IA LAB #: 132 IA LAB #: 022

MINNESOTA VALLEY TESTING LABORATORIES, INC.

1126 N. Front St. ~ New Ulm, MN 56073 ~ 800-782-3557 ~ Fax 507-359-2890
1411 S. 12th St. ~ Bismarck, ND 58502 ~ 800-279-6885 ~ Fax 701-258-9724
35 W. Lincoln Way ~ Nevada, IA 50201 ~ 800-362-0855 ~ Fax 515-382-3885
www.mvtl.com

MEMBER ACIL

BARRY BOTNEN
ENERGY & ENVIRONMENTAL RESEARCH CTR
UNIVERSITY OF NORTH DAKOTA
GRAND FORKS ND 58203

Report Date: 5 Jun 06
Lab Number: 06-A20653
Work Order #:82-914
Account #: 007033
Sample Matrix: GROUNDWATER
Date Sampled: 19 May 06 10:05
Date Received: 24 May 06
PO #: PDB

Project Name: PDB

Sample Description: DI-IN "D" 5-19-06

Temp at Receipt: 4.0 C

	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
Methyl Tert-Butyl Ether	< 1	ppb	1	8021/5030	30 May 06	RDQ
Benzene	< 1	ppb	1	8021/5030	30 May 06	RDQ
Toluene	< 1	ppb	1	8021/5030	30 May 06	RDQ
Ethyl Benzene	< 1	ppb	1	8021/5030	30 May 06	RDQ
Xylenes (Total)	< 3	ppb	3	8021/5030	30 May 06	RDQ
GRO (TPH)	< 0.2	mg/L	0.2	8015B/OA1	30 May 06	RDQ

BTEX/GRO Sample pH < 2

BTEX SURROGATE RECOVERY: 105 %

GRO SURROGATE RECOVERY: 83 %

RL = Reporting Limit

Elevated "Less Than Result" (<): @ = Due to sample matrix
! = Due to sample quantity
= Due to sample concentration
+ = Due to extract volume

CERTIFICATION: MN LAB # 027-015-125 WI LAB # 999447680 ND MICRO # 1013-M ND WW/DW # R-040 IA LAB #: 132 IA LAB #: 022

MINNESOTA VALLEY TESTING LABORATORIES, INC.
1126 N. Front St. ~ New Ulm, MN 56073 ~ 800-782-3557 ~ Fax 507-359-2890
1411 S. 12th St. ~ Bismarck, ND 58502 ~ 800-279-6885 ~ Fax 701-258-9724
35 W. Lincoln Way ~ Nevada, IA 50201 ~ 800-362-0855 ~ Fax 515-382-3885
www.mvtl.com

MEMBER ACIL

Report Date: 5 Jun 06
Lab Number: 06-A20654
Work Order #:82-914
Account #: 007033
Sample Matrix: GROUNDWATER
Date Sampled: 19 May 06 10:30
Date Received: 24 May 06
PO #: PDB

BARRY BOTNEN
ENERGY & ENVIRONMENTAL RESEARCH CTR
UNIVERSITY OF NORTH DAKOTA
GRAND FORKS ND 58203

Project Name: PDB

Sample Description: VOC-IN 5-19-06

Temp at Receipt: 4.0 C

	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
Methyl Tert-Butyl Ether	< 200 #	ppb	1	8021/5030	30 May 06	RDQ
Benzene	11010	ppb	1.0	8021/5030	30 May 06	RDQ
Toluene	14060	ppb	1.0	8021/5030	30 May 06	RDQ
Ethyl Benzene	1967	ppb	1.0	8021/5030	30 May 06	RDQ
Xylenes (Total)	9577	ppb	3.0	8021/5030	30 May 06	RDQ
GRO (TPH)	79.27	mg/L	0.200	8015B/OA1	30 May 06	RDQ

BTEX/GRO Sample pH < 2

BTEX SURROGATE RECOVERY: 107 %

GRO SURROGATE RECOVERY: 89 %

GRO(TPH) pattern is characteristic of gasoline.

RL = Reporting Limit

Elevated "Less Than Result" (<): @ = Due to sample matrix
! = Due to sample quantity
= Due to sample concentration
+ = Due to extract volume

CERTIFICATION: MN LAB # 027-015-125 WI LAB # 999447680 ND MICRO # 1013-M ND WW/DW # R-040 IA LAB #: 132 IA LAB #: 022

MINNESOTA VALLEY TESTING LABORATORIES, INC.
1126 N. Front St. ~ New Ulm, MN 56073 ~ 800-782-3557 ~ Fax 507-359-2890
1411 S. 12th St. ~ Bismarck, ND 58502 ~ 800-279-6885 ~ Fax 701-258-9724
35 W. Lincoln Way ~ Nevada, IA 50201 ~ 800-362-0855 ~ Fax 515-382-3885
www.mvtl.com

MEMBER ACIL

BARRY BOTNEN
ENERGY & ENVIRONMENTAL RESEARCH CTR
UNIVERSITY OF NORTH DAKOTA
GRAND FORKS ND 58203

Report Date: 5 Jun 06
Lab Number: 06-A20655
Work Order #:82-914
Account #: 007033
Sample Matrix: GROUNDWATER
Date Sampled: 19 May 06 10:35
Date Received: 24 May 06
PO #: PDB

Project Name: PDB

Sample Description: VOC-IN "D" 5-19-06

Temp at Receipt: 4.0 C

	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
Methyl Tert-Butyl Ether	< 200 #	ppb	1	8021/5030	30 May 06	RDQ
Benzene	11160	ppb	1.0	8021/5030	30 May 06	RDQ
Toluene	14240	ppb	1.0	8021/5030	30 May 06	RDQ
Ethyl Benzene	1996	ppb	1.0	8021/5030	30 May 06	RDQ
Xylenes (Total)	9732	ppb	3.0	8021/5030	30 May 06	RDQ
GRO (TPH)	79.55	mg/L	0.200	8015B/OA1	30 May 06	RDQ

BTEX/GRO Sample pH < 2

BTEX SURROGATE RECOVERY: 107 %

GRO SURROGATE RECOVERY: 88 %

GRO(TPH) pattern is characteristic of gasoline.

RL = Reporting Limit

Elevated "Less Than Result" (<): @ = Due to sample matrix # = Due to sample concentration
! = Due to sample quantity + = Due to extract volume

CERTIFICATION: MN LAB # 027-015-125 WI LAB # 999447680 ND MICRO # 1013-M ND WW/DW # R-040 IA LAB #: 132 IA LAB #: 022

MINNESOTA VALLEY TESTING LABORATORIES, INC.

1126 N. Front St. ~ New Ulm, MN 56073 ~ 800-782-3557 ~ Fax 507-359-2890
1411 S. 12th St. ~ Bismarck, ND 58502 ~ 800-279-6885 ~ Fax 701-258-9724
35 W. Lincoln Way ~ Nevada, IA 50201 ~ 800-362-0855 ~ Fax 515-382-3885
www.mvtl.com

MEMBER ACIL

BARRY BOTNEN
ENERGY & ENVIRONMENTAL RESEARCH CTR
UNIVERSITY OF NORTH DAKOTA
GRAND FORKS ND 58203

Report Date: 5 Jun 06
Lab Number: 06-A20656
Work Order #:82-914
Account #: 007033
Sample Matrix: GROUNDWATER
Date Sampled: 23 May 06 10:00
Date Received: 24 May 06
PO #: PDB

Project Name: PDB

Sample Description: DI-OUT 5-23-06

Temp at Receipt: 4.0 C

	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
Methyl Tert-Butyl Ether	< 200 #	ppb	1	8021/5030	30 May 06	RDQ
Benzene	2831	ppb	1.0	8021/5030	30 May 06	RDQ
Toluene	3508	ppb	1.0	8021/5030	30 May 06	RDQ
Ethyl Benzene	456.9	ppb	1.0	8021/5030	30 May 06	RDQ
Xylenes (Total)	2157	ppb	3.0	8021/5030	30 May 06	RDQ
GRO (TPH)	21.23	mg/L	0.200	8015B/OA1	2 Jun 06	RDQ

BTEX/GRO Sample pH < 2

BTEX SURROGATE RECOVERY: 107 %

GRO SURROGATE RECOVERY: 91 %

GRO(TPH) pattern is characteristic of gasoline.

RL = Reporting Limit

Elevated "Less Than Result" (<): @ = Due to sample matrix # = Due to sample concentration
! = Due to sample quantity + = Due to extract volume

CERTIFICATION: MN LAB # 027-015-125 WI LAB # 999447680 ND MICRO # 1013-M ND WW/DW # R-040 IA LAB #: 132 IA LAB #: 022

MINNESOTA VALLEY TESTING LABORATORIES, INC.

1126 N. Front St. ~ New Ulm, MN 56073 ~ 800-782-3557 ~ Fax 507-359-2890
1411 S. 12th St. ~ Bismarck, ND 58502 ~ 800-279-6885 ~ Fax 701-258-9724
35 W. Lincoln Way ~ Nevada, IA 50201 ~ 800-362-0855 ~ Fax 515-382-3885
www.mvtl.com

MEMBER ACIL

BARRY BOTNEN
ENERGY & ENVIRONMENTAL RESEARCH CTR
UNIVERSITY OF NORTH DAKOTA
GRAND FORKS ND 58203

Project Name: PDB

Sample Description: DI-OUT "D" 5-23-06

Report Date: 5 Jun 06
Lab Number: 06-A20657
Work Order #:82-914
Account #: 007033
Sample Matrix: GROUNDWATER
Date Sampled: 23 May 06 10:05
Date Received: 24 May 06
PO #: PDB

Temp at Receipt: 4.0 C

	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
Methyl Tert-Butyl Ether	< 200 #	ppb	1	8021/5030	30 May 06	RDQ
Benzene	2961	ppb	1.0	8021/5030	30 May 06	RDQ
Toluene	3562	ppb	1.0	8021/5030	30 May 06	RDQ
Ethyl Benzene	434.0	ppb	1.0	8021/5030	30 May 06	RDQ
Xylenes (Total)	2377	ppb	3.0	8021/5030	30 May 06	RDQ
GRO (TPH)	21.28	mg/L	0.200	8015B/OA1	2 Jun 06	RDQ

BTEX/GRO Sample pH < 2

BTEX SURROGATE RECOVERY: 108 %

GRO SURROGATE RECOVERY: 86 %

GRO(TPH) pattern is characteristic of gasoline.

RL = Reporting Limit

Elevated "Less Than Result" (<): @ = Due to sample matrix # = Due to sample concentration
! = Due to sample quantity + = Due to extract volume

CERTIFICATION: MN LAB # 027-015-125 WI LAB # 999447680 ND MICRO # 1013-M ND WW/DW # R-040 IA LAB #: 132 IA LAB #: 022

MINNESOTA VALLEY TESTING LABORATORIES, INC.
1126 N. Front St. ~ New Ulm, MN 56073 ~ 800-782-3557 ~ Fax 507-359-2890
1411 S. 12th St. ~ Bismarck, ND 58502 ~ 800-279-6885 ~ Fax 701-258-9724
35 W. Lincoln Way ~ Nevada, IA 50201 ~ 800-362-0855 ~ Fax 515-382-3885
www.mvtl.com

Report Date: 5 Jun 06
Lab Number: 06-A20658
Work Order #:82-914
Account #: 007033
Sample Matrix: GROUNDWATER
Date Sampled: 23 May 06 10:30
Date Received: 24 May 06
PO #: PDB

BARRY BOTNEN
ENERGY & ENVIRONMENTAL RESEARCH CTR
UNIVERSITY OF NORTH DAKOTA
GRAND FORKS ND 58203

Project Name: PDB

Sample Description: VOC-OUT 5-23-06

Temp at Receipt: 4.0 C

	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
Methyl Tert-Butyl Ether	< 200 #	ppb	1	8021/5030	30 May 06	RDQ
Benzene	5863	ppb	1.0	8021/5030	30 May 06	RDQ
Toluene	7809	ppb	1.0	8021/5030	30 May 06	RDQ
Ethyl Benzene	1046	ppb	1.0	8021/5030	30 May 06	RDQ
Xylenes (Total)	5551	ppb	3.0	8021/5030	30 May 06	RDQ
GRO (TPH)	45.74	mg/L	0.200	8015B/OA1	30 May 06	RDQ

BTEX/GRO Sample pH < 2

BTEX SURROGATE RECOVERY: 105 %

GRO SURROGATE RECOVERY: 88 %

GRO(TPH) pattern is characteristic of gasoline.

RL = Reporting Limit

Elevated "Less Than Result" (<): @ = Due to sample matrix # = Due to sample concentration
! = Due to sample quantity + = Due to extract volume

CERTIFICATION: MN LAB # 027-015-125 WI LAB # 999447680 ND MICRO # 1013-M ND WW/DW # R-040 IA LAB #: 132 IA LAB #: 022

MINNESOTA VALLEY TESTING LABORATORIES, INC.
1126 N. Front St. ~ New Ulm, MN 56073 ~ 800-782-3557 ~ Fax 507-359-2890
1411 S. 12th St. ~ Bismarck, ND 58502 ~ 800-279-6885 ~ Fax 701-258-9724
35 W. Lincoln Way ~ Nevada, IA 50201 ~ 800-362-0855 ~ Fax 515-382-3885
www.mvtl.com

BARRY BOTNEN
ENERGY & ENVIRONMENTAL RESEARCH CTR
UNIVERSITY OF NORTH DAKOTA
GRAND FORKS ND 58203

Report Date: 5 Jun 06
Lab Number: 06-A20659
Work Order #:82-914
Account #: 007033
Sample Matrix: GROUNDWATER
Date Sampled: 23 May 06 10:35
Date Received: 24 May 06
PO #: PDB

Project Name: PDB

Sample Description: VOC-OUT "D" 5-23-06

Temp at Receipt: 4.0 C

	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
Methyl Tert-Butyl Ether	< 200 #	ppb	1	8021/5030	30 May 06	RDQ
Benzene	5793	ppb	1.0	8021/5030	30 May 06	RDQ
Toluene	7637	ppb	1.0	8021/5030	30 May 06	RDQ
Ethyl Benzene	1016	ppb	1.0	8021/5030	30 May 06	RDQ
Xylenes (Total)	5397	ppb	3.0	8021/5030	30 May 06	RDQ
GRO (TPH)	46.63	mg/L	0.200	8015B/OA1	30 May 06	RDQ

BTEX/GRO Sample pH < 2

BTEX SURROGATE RECOVERY: 106 %

GRO SURROGATE RECOVERY: 88 %

GRO(TPH) pattern is characteristic of gasoline.

RL = Reporting Limit

Elevated "Less Than Result" (<): @ = Due to sample matrix # = Due to sample concentration
! = Due to sample quantity + = Due to extract volume

CERTIFICATION: MN LAB # 027-015-125 WI LAB # 999447680 ND MICRO # 1013-M ND WW/DW # R-040 IA LAB #: 132 IA LAB #: 022

CHAIN OF CUSTODY RECORD

Page 1 of 1

PLEASE DO NOT WRITE IN THE SHADED AREAS

MVTL LABORATORIES, Inc.
1411 South 12th Street
Bismarck, ND 58504
Phone: (701) 258-9720
Toll Free: (800) 279-6885 Fax: (701) 258-9724

W1968-1969

WORK ORDER # 82-914

ompany Name and Address:
EERC
P.O. Box 9018
GRAND FORKS ND 58202

illing Address (indicate name and address if different from above):

Account #: 00-1033
Phone #: 701 777-5073
Contact: BARRY BOTNEN
Fax #:
Name of Sampler: B. Botnen
For faxed report check box ☐
Quote #:
Date Submitted: 5/23/06
Project Name/Number: PDB
Purchase Order #:

Lab Use Only	Your Sample I.D. or Number	Sample Description	Date / Time	Type of Sample (Matrix or Substance) Soil	Water	Food	Other (Please Be Specific)	Analyze For: Vitamin A, TKN, Iron, Calcium, BOD, COD, Acetone, Shelf Life
	Example	Tank Bottom Tank #3	01/01/99 11:45 a.m.			X	Sampled Liquid Layer Not bottom sludge	MBTEX + GRO
12652	DI-IN		5-19-06 1000		X			
53	DI-IN "D"		5-19-06 1005		X			
54	VOC. IN		5-19-06 1080		X			* INTERESTED IN LOW LEVEL MTBE.
55	VOC-IN "D"		5-19-06 1035		X			
56	DI-OUT		5-23-06 1000		X			
57	DI-OUT "D"		5-23-06 1005		X			
58	VOC-OUT		5-23-06 1030		X			
59	VOC-OUT "D"		5-23-06 1035		Y			

	Transferred by:	Comments: (Sample Condition)	Date / Time	Received by:	Comments: (Sample Condition)	Date / Time	°C
1			5/23/06 1100	Mary D. Locke		24 MAY 06 UDS	4.0C
2							
3							

Disposed of By: Disposal Comments:

Please submit the top two copies with your samples. We will return the completed original with your results.

MINNESOTA VALLEY TESTING LABORATORIES, INC.
1126 N. Front St. ~ New Ulm, MN 56073 ~ 800-782-3557 ~ Fax 507-359-2890
1411 S. 12th St. ~ Bismarck, ND 58502 ~ 800-279-6885 ~ Fax 701-258-9724
35 W. Lincoln Way ~ Nevada, IA 50201 ~ 800-362-0855 ~ Fax 515-382-3885
www.mvtl.com

MEMBER ACIL

Report Date: 12 Jun 06
Lab Number: 06-A22526
Work Order #:82-1006
Account #: 007033
Sample Matrix: GROUNDWATER
Date Sampled: 31 May 06 9:00
Date Received: 6 Jun 06
PO #: 31395B

BARRY BOTNEN
ENERGY & ENVIRONMENTAL RESEARCH CTR
UNIVERSITY OF NORTH DAKOTA
GRAND FORKS ND 58203

Project Name: PASSIVE DIFFUSION BAG

Sample Description: DI-IN

Temp at Receipt: 7.0 C
Temp Note: ABOVE TEMP, RUN PER CLIENT.

	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
Methyl Tert-Butyl Ether	< 1	ppb	1	8021/5030	7 Jun 06	RDQ
Benzene	< 1	ppb	1	8021/5030	7 Jun 06	RDQ
Toluene	< 1	ppb	1	8021/5030	7 Jun 06	RDQ
Ethyl Benzene	< 1	ppb	1	8021/5030	7 Jun 06	RDQ
Xylenes (Total)	< 3	ppb	3	8021/5030	7 Jun 06	RDQ
GRO (TPH)	< 0.2	mg/L	0.2	8015B/OA1	7 Jun 06	RDQ

BTEX/GRO Sample pH < 2

BTEX SURROGATE RECOVERY: 99 %

GRO SURROGATE RECOVERY: 84 %

RL = Reporting Limit

Elevated "Less Than Result" (<): @ = Due to sample matrix # = Due to sample concentration
! = Due to sample quantity + = Due to extract volume

CERTIFICATION: MN LAB # 027-015-125 WI LAB # 999447680 ND MICRO # 1013-M ND WW/DW # R-040 IA LAB #: 132 IA LAB #: 022

MINNESOTA VALLEY TESTING LABORATORIES, INC.
1126 N. Front St. ~ New Ulm, MN 56073 ~ 800-782-3557 ~ Fax 507-359-2890
1411 S. 12th St. ~ Bismarck, ND 58502 ~ 800-279-6885 ~ Fax 701-258-9724
35 W. Lincoln Way ~ Nevada, IA 50201 ~ 800-362-0855 ~ Fax 515-382-3885
www.mvtl.com

BARRY BOTNEN
ENERGY & ENVIRONMENTAL RESEARCH CTR
UNIVERSITY OF NORTH DAKOTA
GRAND FORKS ND 58203

Project Name: PASSIVE DIFFUSION BAG

Sample Description: DI-IN D

Report Date: 12 Jun 06
Lab Number: 06-A22527
Work Order #:82-1006
Account #: 007033
Sample Matrix: GROUNDWATER
Date Sampled: 31 May 06 9:05
Date Received: 6 Jun 06
PO #: 31395B

Temp at Receipt: 7.0 C
Temp Note: ABOVE TEMP, RUN PER CLIENT.

	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
Methyl Tert-Butyl Ether	< 1	ppb	1	8021/5030	7 Jun 06	RDQ
Benzene	< 1	ppb	1	8021/5030	7 Jun 06	RDQ
Toluene	< 1	ppb	1	8021/5030	7 Jun 06	RDQ
Ethyl Benzene	< 1	ppb	1	8021/5030	7 Jun 06	RDQ
Xylenes (Total)	< 3	ppb	3	8021/5030	7 Jun 06	RDQ
GRO (TPH)	< 0.2	mg/L	0.2	8015B/OA1	7 Jun 06	RDQ

BTEX/GRO Sample pH < 2

BTEX SURROGATE RECOVERY: 99 %

GRO SURROGATE RECOVERY: 83 %

RL = Reporting Limit

Elevated "Less Than Result" (<): @ = Due to sample matrix # = Due to sample concentration
! = Due to sample quantity + = Due to extract volume

CERTIFICATION: MN LAB # 027-015-125 WI LAB # 999447680 ND MICRO # 1013-M ND WW/DW # R-040 IA LAB #: 132 IA LAB #: 022

MINNESOTA VALLEY TESTING LABORATORIES, INC.
1126 N. Front St. ~ New Ulm, MN 56073 ~ 800-782-3557 ~ Fax 507-359-2890
1411 S. 12th St. ~ Bismarck, ND 58502 ~ 800-279-6885 ~ Fax 701-258-9724
35 W. Lincoln Way ~ Nevada, IA 50201 ~ 800-362-0855 ~ Fax 515-382-3885
www.mvtl.com

MEMBER ACIL

Report Date: 12 Jun 06
Lab Number: 06-A22528
Work Order #:82-1006
Account #: 007033
Sample Matrix: GROUNDWATER
Date Sampled: 31 May 06 9:36
Date Received: 6 Jun 06
PO #: 31395B

BARRY BOTNEN
ENERGY & ENVIRONMENTAL RESEARCH CTR
UNIVERSITY OF NORTH DAKOTA
GRAND FORKS ND 58203

Project Name: PASSIVE DIFFUSION BAG

Sample Description: VOC-IN

Temp at Receipt: 7.0 C
Temp Note: ABOVE TEMP, RUN PER CLIENT.

	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
Methyl Tert-Butyl Ether	< 100 #	ppb	1	8021/5030	7 Jun 06	RDQ
Benzene	233.6	ppb	1.0	8021/5030	7 Jun 06	RDQ
Toluene	517.0	ppb	1.0	8021/5030	7 Jun 06	RDQ
Ethyl Benzene	1295	ppb	1.0	8021/5030	7 Jun 06	RDQ
Xylenes (Total)	8740	ppb	3.0	8021/5030	7 Jun 06	RDQ
GRO (TPH)	39.91	mg/L	0.200	8015B/OA1	7 Jun 06	RDQ

BTEX/GRO Sample pH < 2

BTEX SURROGATE RECOVERY: 106 %

GRO SURROGATE RECOVERY: 96 %

GRO(TPH) pattern is characteristic of gasoline.

RL = Reporting Limit

Elevated "Less Than Result" (<): @ = Due to sample matrix # = Due to sample concentration
! = Due to sample quantity + = Due to extract volume

CERTIFICATION: MN LAB # 027-015-125 WI LAB # 999447680 ND MICRO # 1013-M ND WW/DW # R-040 IA LAB #: 132 IA LAB #: 022

MINNESOTA VALLEY TESTING LABORATORIES, INC.
1126 N. Front St. ~ New Ulm, MN 56073 ~ 800-782-3557 ~ Fax 507-359-2890
1411 S. 12th St. ~ Bismarck, ND 58502 ~ 800-279-6885 ~ Fax 701-258-9724
35 W. Lincoln Way ~ Nevada, IA 50201 ~ 800-362-0855 ~ Fax 515-382-3885
www.mvtl.com

MEMBER ACIL

Report Date: 12 Jun 06
Lab Number: 06-A22529
Work Order #:82-1006
Account #: 007033
Sample Matrix: GROUNDWATER
Date Sampled: 31 May 06 9:35
Date Received: 6 Jun 06
PO #: 31395B

Temp at Receipt: 7.0 C
Temp Note: ABOVE TEMP, RUN PER CLIENT.

BARRY BOTNEN
ENERGY & ENVIRONMENTAL RESEARCH CTR
UNIVERSITY OF NORTH DAKOTA
GRAND FORKS ND 58203

Project Name: PASSIVE DIFFUSION BAG

Sample Description: VOC-IN C

	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
Methyl Tert-Butyl Ether	< 100 #	ppb	1	8021/5030	7 Jun 06	RDQ
Benzene	239.0	ppb	1.0	8021/5030	7 Jun 06	RDQ
Toluene	520.1	ppb	1.0	8021/5030	7 Jun 06	RDQ
Ethyl Benzene	1293	ppb	1.0	8021/5030	7 Jun 06	RDQ
Xylenes (Total)	8700	ppb	3.0	8021/5030	7 Jun 06	RDQ
GRO (TPH)	40.35	mg/L	0.200	8015B/OA1	7 Jun 06	RDQ

BTEX/GRO Sample pH < 2

BTEX SURROGATE RECOVERY: 106 %

GRO SURROGATE RECOVERY: 95 %

GRO(TPH) pattern is characteristic of gasoline.

RL = Reporting Limit

Elevated "Less Than Result" (<): @ = Due to sample matrix # = Due to sample concentration
! = Due to sample quantity + = Due to extract volume

CERTIFICATION: MN LAB # 027-015-125 WI LAB # 999447680 ND MICRO # 1013-M ND WW/DW # R-040 IA LAB #: 132 IA LAB #: 022

MINNESOTA VALLEY TESTING LABORATORIES, INC.
1126 N. Front St. ~ New Ulm, MN 56073 ~ 800-782-3557 ~ Fax 507-359-2890
1411 S. 12th St. ~ Bismarck, ND 58502 ~ 800-279-6885 ~ Fax 701-258-9724
35 W. Lincoln Way ~ Nevada, IA 50201 ~ 800-362-0855 ~ Fax 515-382-3885
www.mvtl.com
MEMBER ACIL

BARRY BOTNEN
ENERGY & ENVIRONMENTAL RESEARCH CTR
UNIVERSITY OF NORTH DAKOTA
GRAND FORKS ND 58203

Project Name: PASSIVE DIFFUSION BAG

Sample Description: DI-OUT

Report Date: 12 Jun 06
Lab Number: 06-A22530
Work Order #:82-1006
Account #: 007033
Sample Matrix: GROUNDWATER
Date Sampled: 2 Jun 06 9:00
Date Received: 6 Jun 06
PO #: 31395B

Temp at Receipt: 7.0 C
Temp Note: ABOVE TEMP, RUN PER CLIENT.

	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
Methyl Tert-Butyl Ether	< 10 #	ppb	1	8021/5030	8 Jun 06	RDQ
Benzene	62.2	ppb	1.0	8021/5030	8 Jun 06	RDQ
Toluene	139.0	ppb	1.0	8021/5030	8 Jun 06	RDQ
Ethyl Benzene	369.4	ppb	1.0	8021/5030	8 Jun 06	RDQ
Xylenes (Total)	2694	ppb	3.0	8021/5030	9 Jun 06	RDQ
GRO (TPH)	11.32	mg/L	0.200	8015B/OA1	8 Jun 06	RDQ

BTEX/GRO Sample pH < 2

BTEX SURROGATE RECOVERY: 111 %

GRO SURROGATE RECOVERY: 115 %

GRO(TPH) pattern is characteristic of gasoline.
GRO(TPH) matrix spike and matrix spike duplicate recoveries for toluene were out of acceptable range. All other QC was acceptable.

RL = Reporting Limit

Elevated "Less Than Result" (<): @ = Due to sample matrix # = Due to sample concentration
! = Due to sample quantity + = Due to extract volume

CERTIFICATION: MN LAB # 027-015-125 WI LAB # 999447680 ND MICRO # 1013-M ND WW/DW # R-040 IA LAB #: 132 IA LAB #: 022

MINNESOTA VALLEY TESTING LABORATORIES, INC.
1126 N. Front St. ~ New Ulm, MN 56073 ~ 800-782-3557 ~ Fax 507-359-2890
1411 S. 12th St. ~ Bismarck, ND 58502 ~ 800-279-6885 ~ Fax 701-258-9724
35 W. Lincoln Way ~ Nevada, IA 50201 ~ 800-362-0855 ~ Fax 515-382-3885
www.mvtl.com

Report Date: 12 Jun 06
Lab Number: 06-A22531
Work Order #:82-1006
Account #: 007033
Sample Matrix: GROUNDWATER
Date Sampled: 2 Jun 06 9:05
Date Received: 6 Jun 06
PO #: 31395B

BARRY BOTNEN
ENERGY & ENVIRONMENTAL RESEARCH CTR
UNIVERSITY OF NORTH DAKOTA
GRAND FORKS ND 58203

Project Name: PASSIVE DIFFUSION BAG

Sample Description: DI-OUT D

Temp at Receipt: 7.0 C
Temp Note: ABOVE TEMP, RUN PER CLIENT.

	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
Methyl Tert-Butyl Ether	< 10 #	ppb	1	8021/5030	8 Jun 06	RDQ
Benzene	61.8	ppb	1.0	8021/5030	8 Jun 06	RDQ
Toluene	134.1	ppb	1.0	8021/5030	8 Jun 06	RDQ
Ethyl Benzene	361.4	ppb	1.0	8021/5030	8 Jun 06	RDQ
Xylenes (Total)	2620	ppb	3.0	8021/5030	9 Jun 06	RDQ
GRO (TPH)	11.12	mg/L	0.200	8015B/OA1	8 Jun 06	RDQ

BTEX/GRO Sample pH < 2

BTEX SURROGATE RECOVERY: 111 %

GRO SURROGATE RECOVERY: 114 %

GRO(TPH) pattern is characteristic of gasoline.
GRO(TPH) matrix spike and matrix spike duplicate recoveries for toluene were out of acceptable range. All other QC was acceptable.

RL = Reporting Limit

Elevated "Less Than Result" (<): @ = Due to sample matrix # = Due to sample concentration
! = Due to sample quantity + = Due to extract volume

CERTIFICATION: MN LAB # 027-015-125 WI LAB # 999447680 ND MICRO # 1013-M ND WW/DW # R-040 IA LAB #: 132 IA LAB #: 022

MINNESOTA VALLEY TESTING LABORATORIES, INC.
1126 N. Front St. ~ New Ulm, MN 56073 ~ 800-782-3557 ~ Fax 507-359-2890
1411 S. 12th St. ~ Bismarck, ND 58502 ~ 800-279-6885 ~ Fax 701-258-9724
35 W. Lincoln Way ~ Nevada, IA 50201 ~ 800-362-0855 ~ Fax 515-382-3885
www.mvtl.com

BARRY BOTNEN
ENERGY & ENVIRONMENTAL RESEARCH CTR
UNIVERSITY OF NORTH DAKOTA
GRAND FORKS ND 58203

Project Name: PASSIVE DIFFUSION BAG

Sample Description: VOC-OUT

Report Date: 12 Jun 06
Lab Number: 06-A22532
Work Order #:82-1006
Account #: 007033
Sample Matrix: GROUNDWATER
Date Sampled: 2 Jun 06 9:30
Date Received: 6 Jun 06
PO #: 31395B

Temp at Receipt: 7.0 C
Temp Note: ABOVE TEMP, RUN PER CLIENT.

	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
Methyl Tert-Butyl Ether	< 10 #	ppb	1	8021/5030	8 Jun 06	RDQ
Benzene	102.4	ppb	1.0	8021/5030	8 Jun 06	RDQ
Toluene	207.1	ppb	1.0	8021/5030	8 Jun 06	RDQ
Ethyl Benzene	556.6	ppb	1.0	8021/5030	8 Jun 06	RDQ
Xylenes (Total)	4079	ppb	3.0	8021/5030	9 Jun 06	RDQ
GRO (TPH)	20.98	mg/L	0.200	8015B/OA1	9 Jun 06	RDQ

BTEX/GRO Sample pH < 2

BTEX SURROGATE RECOVERY: 117 %

GRO SURROGATE RECOVERY: 90 %

GRO(TPH) pattern is characteristic of gasoline.
GRO(TPH) matrix spike and matrix spike duplicate recoveries for toluene were out of acceptable range. All other QC was acceptable.

RL = Reporting Limit

Elevated "Less Than Result" (<): @ = Due to sample matrix # = Due to sample concentration
! = Due to sample quantity + = Due to extract volume

CERTIFICATION: MN LAB # 027-015-125 WI LAB # 999447680 ND MICRO # 1013-M ND WW/DW # R-040 IA LAB #: 132 IA LAB #: 022

MINNESOTA VALLEY TESTING LABORATORIES, INC.
1126 N. Front St. ~ New Ulm, MN 56073 ~ 800-782-3557 ~ Fax 507-359-2890
1411 S. 12th St. ~ Bismarck, ND 58502 ~ 800-279-6885 ~ Fax 701-258-9724
35 W. Lincoln Way ~ Nevada, IA 50201 ~ 800-362-0855 ~ Fax 515-382-3885
www.mvtl.com

BARRY BOTNEN
ENERGY & ENVIRONMENTAL RESEARCH CTR
UNIVERSITY OF NORTH DAKOTA
GRAND FORKS ND 58203

Report Date: 12 Jun 06
Lab Number: 06-A22533
Work Order #:82-1006
Account #: 007033
Sample Matrix: GROUNDWATER
Date Sampled: 2 Jun 06 9:35
Date Received: 6 Jun 06
PO #: 31395B

Project Name: PASSIVE DIFFUSION BAG

Sample Description: VOC-OUT D

Temp at Receipt: 7.0 C
Temp Note: ABOVE TEMP, RUN PER CLIENT.

	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
Methyl Tert-Butyl Ether	< 50 #	ppb	1	8021/5030	7 Jun 06	RDQ
Benzene	108.2	ppb	1.0	8021/5030	7 Jun 06	RDQ
Toluene	233.3	ppb	1.0	8021/5030	7 Jun 06	RDQ
Ethyl Benzene	617.6	ppb	1.0	8021/5030	7 Jun 06	RDQ
Xylenes (Total)	4267	ppb	3.0	8021/5030	7 Jun 06	RDQ
GRO (TPH)	20.32	mg/L	0.200	8015B/OA1	7 Jun 06	RDQ

BTEX/GRO Sample pH < 2

BTEX SURROGATE RECOVERY: 104 %

GRO SURROGATE RECOVERY: 97 %

GRO(TPH) pattern is characteristic of gasoline.

RL = Reporting Limit

Elevated "Less Than Result" (<): @ = Due to sample matrix # = Due to sample concentration
! = Due to sample quantity + = Due to extract volume

CERTIFICATION: MN LAB # 027-015-125 WI LAB # 999447680 ND MICRO # 1013-M ND WW/DW # R-040 IA LAB #: 132 IA LAB #: 022

MVTL LABORATORIES, Inc.
1411 South 12th Street
Bismarck, ND 58504
Phone: (701) 258-9720
Toll Free: (800) 279-6885 Fax: (701) 258-9724

CHAIN OF CUSTODY RECORD

PLEASE DO NOT WRITE IN THE SHADED AREAS

Page 1 of

Company Name and Address:
EERC
PO BOX 9018
GRAND FORKS, ND 58201

Billing Address (indicate name and address if different from above):
- SAME

WORK ORDER # 82-1006

Account #: 007033

Contact: LARRY BOTHEN

Name of Sampler: B. BOTHEN

Quote #:

Project Name/Number: PASSIVE DIFFUSION BTA

Phone #: 701 777-5073

Fax #: 701 777 5181

For faxed report check box ☐

Date Submitted: 6/5/06

Purchase Order #: 31395B

Lab Use Only	Your Sample I.D. or Number	Sample Description	Date / Time	Type of Sample (Matrix or Substance): Soil	Water	Food	Other (Please Be Specific)	Analyze For: Vitamin A, TKN, Iron, Calcium, BOD, COD, Acetone, Shelf Life
	Example	Tank Bottom Tank #3	01/01/99 11:45 a.m.			X	Sampled Liquid Layer Not bottom sludge	
A20526	DI-IN		5/31/06 0900		X			MBTEX & GRO (PPA)
27	DI-IN D		5/31/06 0905		X			* PLEASE USE
28	VOC-IN		5/31/06 0910		X			LOW LE
29	VOC-IN D		5/31/06 0915		X			MTBE.
30	DI-OUT		6/2/06 0900		X			
31	DI-OUT D		6/2/06 0905		X			
32	VOC-OUT		6/2/06 0930		X			
33	VOC-OUT D		6/2/06 0935		X			

	Transferred by:	Comments: (Sample Condition)	Date / Time	Received by:	Comments: (Sample Condition)	Date / Time	°C
1			6/5/06 1200	Mary D. Lasa		6/6/06 0900 UPS	7.0
2							
3							

Disposed of By: 6/6/06 for Berry Disposal Comments: Run CO in

K11475 (Rev. 5/96)

Please submit the top two copies with your samples. We will return the completed original with your results.